

1.3.2: Average percentage of courses that include experiential learning through project work/field work/internship during last five years

COURSES THAT INCLUDE EXPERIENTIAL LEARNING

- **Extracts from University Syllabus**

Contents

No.	Programme
1	BBA
2	B.Com Model I
3	B.Com Model III
4	B.A. Malayalam
5	B.A. Political Science
6	B.A. English
7	B.A. Economics
8	B.Sc. Botany
9	B.Sc. Chemistry
10	B.Sc. Mathematics
11	B.Sc. Physics
12	B.Sc. Zoology
13	M.Sc. Chemistry
14	M.Sc. Physics
15	M.A. English
16	M.A. Economics
17	M.Com
18	M.Sc. Data Analytics

BACHELOR OF BUSINESS ADMINISTRATION

**M.G. UNIVERSITY
KOTTAYAM**

(FACULTY OF BUSINESS STUDIES)

**REVISED SYLLABUS FOR THE ACADEMIC YEARS
STARTING 2017-18**

COURSE DESIGN				
Semester	Title	Course	Credit	Hours/week
<u>First semester</u>				
BA1CRT01	Principles and Methodology of Management	Core	4	6
BA1CRT02	Business Accounting	Core	4	6
BA1CMT03	Fundamentals of Business Mathematics	Complementary	4	4
BA1CMT04	Fundamentals of Business Statistics	Complementary	4	4
BA1CCT05	English Paper –I	Common	4	5
			20	25
<u>Second semester</u>				
BA2CRT06	Cost and Management Accounting	Core	4	6
BA2CRT07	Business Communication	Core	4	6
BA2CMT08	Mathematics for Management	Complementary	4	4
BA2CMT09	Statistics for Management	Complementary	4	4
BA2CCT10	English Paper –II	Common	4	5
			20	25
<u>Third Semester</u>				
BA3CRT11	Human Resource Management	Core	4	5
BA3CRT12	Marketing Management	Core	4	5
BA3CRT13	Research Methodology	Core	4	5
BA3CMT14	Business Laws	Complementary	4	5
BA3PRP15	Personality Development and Management Skills (Minor Project)	Core	4	5
			20	25
<u>Fourth Semester</u>				
BA4CRT16	Financial Management	Core	4	5
BA4CRT17	Managerial Economics	Core	4	5
BA4CRT18	Entrepreneurship	Core	4	5
BA4CMT19	Basic informatics for Management	Complementary	4	5
BA4CMT20	Corporate Law	Complementary	4	5
			20	25

<u>Fifth Semester</u>				
BA5CRT21	Organisational Behaviour	Core	4	6
BA5OPT22	Open Course	Open	3	4
BA5CRT23	Environment Science and Human Rights	Core	4	5
BA5CMT24	Intellectual Property Rights and Industrial Laws	Complementary	4	5
BA5CRT25	Operations Management	Core	2	2
BA5CRT26	Industrial Relations	Core	3	3
			20	25
<u>Sixth Semester</u>				
BA6OCT27	Optional-I	Optional (Core)	4	5
BA6OCT28	Optional-II	Optional (Core)	4	5
BA6CRT29	Strategic Management	Core	4	5
BA6CRT30	Communication Skills and Personality development	Core	4	5
BA6PRP31	Management Project	Core	4	5
			20	25
	Grand Total		120	150

BA5CRT23 ENVIRONMENT SCIENCE AND HUMAN RIGHTS

Core Course

No. of credit : 4

No. of contact hour: 5

MODULE I**Multidisciplinary nature of environmental studies**

Definition, scope and importance Need for public awareness.

Natural Resources : Renewable and non-renewable resources : Natural resources and associated problems.

a) Forest resources : Use and over-exploitation, deforestation, case studies.

Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification

- Role of individual in conservation of natural resources.
- Equitable use of resources for sustainable life styles.

Ecosystems

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the given ecosystem:- Forest ecosystem

MODULE II**Biodiversity and its conservation**

Introduction, Biogeographical classification of India ,Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India

Environmental Pollution

Definition, Causes, effects and control measures of: -

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides

Social Issues and the Environment- Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people: its problems and concerns, Case studies, Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies, Consumerism and waste products, Environment Protection Act , Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation

MODULE III**Introduction to Environment and Business**

Introduction of ways in which business has and is responding to environmental and business issues; business and sustainable development; issues of corporate/business greening.

MODULE IV**Green entrepreneurship**

What is green entrepreneurship, definition, meaning, scope, nature and characteristics. Green entrepreneurship in India. Difference between conventional and green entrepreneurship.

MODULE V

Human Rights– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).

Human Rights and United Nations – contributions, main human rights related organs - UNESCO, UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights.

Human Rights in India – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities
 Environment and Human Rights - Right to Clean Environment and Public Safety:
 Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New
 Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal,
 Protection of Environment

Conservation of natural resources and human rights: Reports, Case studies and policy formulation. Conservation issues of western ghats- mention Gadgil committee report, Kasthuriengan report. Over exploitation of ground water resources, marine fisheries, sand mining etc.

Internal: Field study

- Visit to a local area to document environmental grassland/ hill /mountain
- Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc
- Study of simple ecosystem-pond, river, hill slopes, etc

(Field work Equal to 5 lecture hours)

REFERENCES

1. Bharucha Erach, Text Book of Environmental Studies for undergraduate Courses. University Press, IInd Edition 2013 (TB)
2. Clark.R.S., Marine Pollution, Clanderson Press Oxford (Ref)
3. Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001 Environmental Encyclopedia, Jaico Publ. House. Mumbai. 1196p .(Ref)
4. De A.K.Environmental Chemistry, Wiley Eastern Ltd.(Ref)
5. Down to Earth, Centre for Science and Environment (Ref)
6. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment, Cambridge University Press 1140pb (Ref)
7. Jadhav.H & Bhosale.V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p (Ref)
8. Mekinney, M.L & Schock.R.M. 1996 Environmental Science Systems & Solutions. Web enhanced edition 639p (Ref)
9. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
10. Odum.E.P 1971. Fundamentals of Ecology. W.B. Saunders Co. USA 574p (Ref)
11. Rao.M.N & Datta.A.K. 1987 Waste Water treatment Oxford & IBII Publication Co.Pvt.Ltd.345p (Ref)
12. Rajagopalan. R, Environmental Studies from crisis and cure, Oxford University Press, Published: 2016 (TB)
13. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut (Ref)
14. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (Ref)

BBA

Semester- III

Type of Course	Course Code	Name of the Paper
Core	CM03CR001	Corporate Accounting
Common	BM03BA901	Business Communication
Common	BM03BA902	Entrepreneurship
Complementary	BM03CA903	Research Methodology
Complementary	BM03CA904	Business Law

Semester – IV

Type of Course	Course Code	Name of the Paper
Complementary	BM04CAA01	Corporate And Industrial Laws
Complementary	EM03CA901	Managerial Economics
Common	BM04BA901	Informatics For Management
Common	BM04BA902	Cost Accounting
Core	BM05BA902	Marketing Management

Semester –V

Type of Course	Course Code	Name of the Paper
Core	BM05BAC01	Management Accounting
Core	BM05BAC02	Financial Management
Core	BM05BA903	Organizational Behavior
Core	BM05BAC03	Human Resource Management
Open Course		See Page No.

Semester –VI

Type of Course	Course Code	Name of the Paper
Core	BM06BA901	Production Management
Core	BM06BA902	Industrial Relations
Core	BB06BAA01	Banking and Insurance
Choice based (core)	BM06BBA04	Advertising And Salesmanship
Choice based (core)	BM06BBA03	Principles of Tourism Management
Core	BM06BA904	Project work

Courses and Duration of Examinations

Total credits: 120

Semesters- 6

Working Days per Semester: 90

Working Hours per Semester: 450

Examination- External Evaluation: 80% and Internal evaluation- 20%

MODEL-I

B.Com Degree Programme Model-I Course Structure

Common Courses

Sl No	Course Name	Credit	Hours per week
1	Language- English-I	4	5
2	Second Language-I	4	4
3	Language- English-II	4	5
4	Second Language-II	4	4
5	Language- English- III	3	3
6	Language- English -IV	3	3
	TOTAL – Common Course 1 – 14 credits and Common Course 2- 8 credits	22	-

Complementary Courses

Sl No	Course Name	Credit	Hours per week
1	Banking and Insurance	3	4
2	Principles of Business Decisions	3	4
	TOTAL	6	

Core Courses

Sl No	Course Name	Credit	Hours per week
1	Dimensions and Methodology of Business Studies	2	3

2	Financial Accounting I	4	5
3	Corporate Regulations and Administration	3	4
4	Financial Accounting II	4	5
5	Business Regulatory Framework	3	4
6	Business Management	3	3
7	Corporate Accounts I	4	5
8	Quantitative Techniques for Business- 1	4	5
9	Financial Markets and Operations	3	4
10	Marketing Management	3	3
11	Optional - 1	4	5
12	Corporate Accounts II	4	6
13	Quantitative Techniques for Business- II	4	6
14	Entrepreneurship Development and Project Management	4	5
15	Optional - 2 -	4	5
16	Cost Accounting - 1	4	6
17	Environment Management and Human Rights	4	5
18	Financial Management	4	5
19	Optional - 3	4	5
20	Cost Accounting - 2	4	6
21	Advertisement and Sales Management	3	4
22	Auditing and Assurance	4	5
23	Management Accounting	4	5
24	Optional - 4	4	5
25	Project and Viva	1	-
	TOTAL	89	

Details of Optional Courses

Sl No	Course Name	Credit	Hours per week
FINANCE AND TAXATION			
1	Goods and Services Tax	4	5
2	Financial Services	4	5
3	Income Tax- I	4	5
4	Income Tax - II	4	5
COMPUTER APPLICATIONS			
1	Information Technology for Business	4	5
2	Information Technology for Office	4	5
3	Computerized Accounting	4	5

Semester- 4

Sl No	Course Code	Course Name	Credit	Hours per week
1		Language- English-I	3	3
2	CO4CRT11	Corporate Accounts II	4	6
3	CO4CRT12	Quantitative Techniques for Business- II	4	6
4	CO4CRT13	Entrepreneurship Development and Project Management	4	5
5	CO4	Optional - 2 -	4	5
	CO4OCT01	Finance and Taxation- Financial Services	4	5
	CO4OCT02	Computer Application- Information Technology for Office (Theory)	3	3
		Information Technology for Office (Practical)	-	2
	CO34OCP01	<i>Computer Application Practical Examination</i> for Information Technology for Office and Information technology for Business	2	NA
	CO4OCT03	Co-operation- Management of Co-operative Enterprises	4	5
	CO4OCT04	Travel and Tourism- Travel and Tourism Infrastructure	4	5
	CO4OCT05	Marketing- Services Marketing	4	5
		TOTAL for streams other than Computer Application	19	25
		TOTAL for Computer Application Stream	20	25

Semester- 5

Sl No	Course Code	Course Name	Credit	Hours per week
1	CO5CRT14	Cost Accounting - 1	4	6
2	CO5CRT15	Environment Management and Human Rights	4	5
3	CO5CRT16	Financial Management	4	5
4		Optional - 3		
	CO5OCT01	Finance and Taxation- Income Tax- I	4	5
	CO5OCT02	Computer Application-	3	3

		Computerised Accounting(Theory)		
		Computerised Accounting (Practical)- Examination in 6th Semester only	-	2
	CO5OCT03	Co-operation- Co-operative Legal System	4	5
	CO5OCT04	Travel and Tourism- Hospitality Management	4	5
	CO5OCT05	Marketing- Marketing Research	4	5
5		Open Course	3	4
		TOTAL for streams other than Computer Application	19	25
		TOTAL for Computer Application stream	18	25

Semester- 6

Sl No	Course Code	Course Name	Credit	Hours per week
1	CO6CRT17	Cost Accounting - 2	4	6
2	CO6CRT18	Advertisement and Sales Management	3	4
3	CO6CRT19	Auditing and Assurance	4	5
4	CO6CRT20	Management Accounting	4	5
5	CO6OCT	Optional - 4	4	5
	CO6OCT01	Finance and Taxation- Income Tax- II	4	5
	CO6OCT02	Computer Application- Software for Business and Research (Theory)	3	3
		Software for Business and Research(Practical)	-	2
	CO56OCP01	Computer Application- Practical Examination – Computerised Accounting and Software for Business and Research	2	NA
	CO6OCT03	Co-operation- Accounting for Co-operative Societies	4	5
	CO6OCT04	Travel and Tourism- Tourism and Cultural Heritage of India	4	5
	CO6OCT05	Marketing- International Marketing	4	5
6	CO6PR01	Project and Viva	1	-
		TOTAL for streams other than Computer Application	20	25
		TOTAL for Computer Application	21	25

Module III

Accounting and Control of Labour Cost- Time Keeping and Time Booking-Methods - Systems of Wage Payment-Time Rate System- Piece Rate System- Differential Piece Rate – Taylor’s differential piece rate system- Merrick’s differential piece rate system- Gantt Task and Bonus plan- Incentive Plans- Halsey Plan - Rowan Plan-Idle Time- Overtime and their Accounting Treatment- Labour Turnover- Causes and effects- Methods of Calculating Labour Turnover. **(20 Hours)**

Module IV

Accounting for Overhead-Classification of Overhead- Segregation of semi variable overhead- Production overhead- Allocation and apportionment- Primary and Secondary Distribution Summary- Absorption of Overhead- Methods of absorption of overheads- Overhead absorption rates- Actual and pre-determined rates- Blanket and Multiple rates- Over-absorption and Under-absorption- Reasons- Disposal- Introduction to Activity Based Costing (Problems of ABC excluded) **(25 Hours)**

Module V

Preparation of Cost Sheet- Cost sheet- Objectives- preparation- Tender and Quotation-Reconciliation Statement –Need- Reasons for disagreements in Profits-Preparation- Memorandum Reconciliation Account **(20 Hours)**

Suggested Readings

1. Jain, S.P., & Narang, K.L., Advanced Cost Accounting, *Kalyani Publishers, New Delhi.*
2. Iyengar, S. P., Cost Accounting, *Sultan Chand & Sons, New Delhi.*
3. Maheswari, S.N., Advanced Cost Accounting, *Sultan Chand & Sons, New Delhi.*
4. Arora, M. N., Cost Accounting, *Vikas Publishing House Pvt. Ltd, New Delhi.*
5. J Madegowda, Advanced Cost accounting, *Himalaya Publishing House, Mumbai*
6. Shukla, M.C., and Grewal, T.S., Cost Accounting, *Sultan Chand & Sons, New Delhi.*
7. Lall Nigam B M and Jain I C, Cost Accounting Principles and Practice, Prentice Hall of India

Core Course 15: ENVIRONMENT MANAGEMENT AND HUMAN RIGHTS

Instructional Hours: 90

Credit: 4

Module I (18 Hours)

Unit 1 : Multidisciplinary nature of environmental studies (2 Hours)

Definition, scope and importance -need for public awareness.

Unit 2 : Natural Resources :

Renewable and non-renewable resources : Natural resources and associated problems.

Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. -**Water resources** : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. **Mineral resources** : Use and exploitation, environmental effects of extracting and using mineral resources, case

studies. **Food resources** : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. **Energy resources**: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies. **Land resources**: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Role of individual in conservation of natural resources- Equitable use of resources for sustainable life styles.

(10 Hours)

Unit 3: Ecosystems

Concept of an ecosystem -Structure and function of an ecosystem -Producers, consumers and decomposers- Energy flow in the ecosystem -Ecological succession-Food chains, food webs and ecological pyramids-Introduction, types, characteristic features, structure and function of the given ecosystem:- Forest ecosystem (6 Hours)

Module II (26 hours)

Unit 1: Biodiversity and its conservation

- Introduction –Bio geographical classification of India -Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values-India as a mega-diversity nation-Hot-spots of biodiversity-Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts-Endangered and endemic species of India

(8 Hours)

Unit 2: Environmental Pollution

Definition, Causes, effects and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management: Causes, effects and control measures of urban and industrial wastes-Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides.

(8 Hours)

Unit 3: Social Issues and the Environment

Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people: its problems and concerns, Case studies, Environmental ethics: Issues and possible solutions,-Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies- Consumerism and waste products- Environment Protection Act - Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness

(10 Hours)

Module – III (15 Hours)

Recent developments- Green Accounting- Meaning- History- Scope and Importance- Importance- Advantages and limitations- Green Banking- Meaning- benefits- coverage- steps in green banking- environmental risks for banks- Green banking initiatives- International initiatives- Initiatives in India- Green Marketing- Meaning- Need and benefits- Challenges-

Green marketing in India- Green washing and consequences- Eco tourism- significance- eco tourism activities in India- Opportunities and challenges – carbon credit and carbon exchanges (over view only) - Environmental audit- concept- need and scope (15 Hours)

Module – IV (13 Hours)

Right to Information Act 2005- Basic terms- Public authority- Competent authority- Appropriate Government- Third Part- Information – record- Right to information- Objectives of the Act- Features of the Act- Obligation of Public authority- Procedure for request of information- time limit- fee- ground of rejection- appeal- exemption from disclosure- Right to access information on specific issues- Banking transactions, insurance transactions, government dealing and related services (13 Hours)

Module – V (18 Hours)

Unit 1- Human Rights– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).

Unit-2 Human Rights and United Nations – contributions, main human rights related organs UNESCO, UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights.

Human Rights in India – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities

Unit-3 Environment and Human Rights - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment

Conservation of natural resources and human rights: Reports, Case studies and policy formulation. Conservation issues of Western Ghats- mention Gadgil committee report, Kasthurirangan report. Over exploitation of ground water resources, marine fisheries, sand mining etc. (18 Hours)

Assignment may include Field study involving

- Visit to a local area to document environmental grassland/ hill /mountain
- Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc
- Study of simple ecosystem-pond, river, hill slopes, etc

Suggested Readings

1. Bharucha Erach, Text Book of Environmental Studies for undergraduate Courses. University Press, IInd Edition 2013 (TB)
2. Clark.R.S., Marine Pollution, Clanderson Press Oxford (Ref)

B.Com Model 1**Semester- III**

Core	CM03BAA01	Marketing Management
Core	CM03BAA02	Financial Accounting
Common Core	CM03BAA03	E-Commerce and General Informatics
Core	CM03BAA04	Business Management
Core(optional)	CM03BBA01	Financial Management

Semester – IV

Core	CM04BAA01	Capital Market
Core	CM04BAA02	Corporate Accounting
Common -4	CM04BA901	Entrepreneurship Development And Project Management
Core	CM04BAA03	Financial Services
Core(optional)		Value Added Tax-Concepts And Practices

Semester –V

Type of Course	Course Code	Name of the Paper
Core	CM05BAA01	Cost Accounting
Complementary Course-1	CM05CAA01	Advertising And Sales Promotion
Core	CM05BAA02	Special Accounting
Core(optional)	CM05BBA01	Income tax Law and Practice.
Open Course		

Semester –VI

Type of Course	Course Code	Name of the Paper
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Core	CM06BAA01	Applied Cost Accounting
Complementary Course-2	CM06CAA01	Principles Of Business Decisions
Core	CM06BAA02	Practical Auditing
Core	CM06BAA03	Accounting For Managerial Decisions
Core	CM06BBA01	Income Tax Assessment and Procedure
Core (P)	CM06BFA01	Project& Viva

Courses and Duration of Examinations

Total credits: 120

Semesters- 6

Working Days per Semester: 90

Working Hours per Semester: 450

Examination- External Evaluation: 80% and Internal evaluation- 20%

B.Com Degree Programme Model-III Course Structure

Common Courses

SI No	Course Name	Credit	Hours per week
1	Language- English-I	4	5
2	Language- English-II	4	5
	TOTAL	8	

Complementary Courses

SI No	Course Name	Credit	Hours per week
1	Business Communication and MIS	4	4
2	Banking and Insurance	3	4
3	Business Environment	4	4
4	Principles of Business Decisions	3	4
5	Business Ethics and Corporate Social Responsibility	3	3
6	Logistics and Supply Chain Management	3	3
7	Taxation- E- Commerce	4	5
	Computer Application- Programming in 'C' (Theory)	3	3
	Computer Application Programming in 'C' (Practical)	1(Combined practical Exam in even sem)	2
	Travel and Tourism E Commerce	4	5
	Office Management and Secretarial Practice E Commerce	4	5
4	Taxation-	4	5

	Income Tax- Assessment and Planning		
	Computer Application- Database Management System	3	3
	Computer Application Database Management System (Practical)	1(Combined practical exam)	2
	Travel and Tourism Tourism Environment and Ecology	4	5
	Office Management and Secretarial Practice Consumer Behaviour	4	5
	TOTAL	28	

Core Courses

Sl No	Course Name	Credit	Hours per week
1	Dimensions and Methodology of Business Studies	2	3
2	Financial Accounting I	4	5
3	Corporate Regulations and Administration	3	4
4	Financial Accounting II	4	5
5	Business Regulatory Framework	3	4
6	Business Management	3	3
7	Corporate Accounts I	4	5
8	Quantitative Techniques for Business- 1	4	5
9	Financial Markets and Operations	3	4
10	Marketing Management	3	3
11	Optional - 1	4	5
12	Corporate Accounts II	4	6
13	Quantitative Techniques for Business- II	4	6
14	Entrepreneurship Development and Project Management	4	5
15	Optional - 2 -	4	5
16	Cost Accounting - 1	4	6
17	Environment Management and Human Rights	4	5
18	Optional - 3	4	5
19	Cost Accounting - 2	4	6
20	Advertisement and Sales Management	3	4
21	Management Accounting	4	5
22	Optional - 4	4	5
23	Project and Viva	1	-
	TOTAL	81	

Semester- 4

Sl No	Course Code	Course Name	Credit	Hours per week
1		Language- English-I	3	3
2	CO4CRT11	Corporate Accounts II	4	6
3	CO4CRT12	Quantitative Techniques for Business- II	4	6
4	CO4CRT13	Entrepreneurship Development and Project Management	4	5
5	CO4	Optional - 2 -	4	5
	CO4OCT01	Finance and Taxation- Financial Services	4	5
	CO4OCT02	Computer Application- Information Technology for Office (Theory)	3	3
		Information Technology for Office (Practical)	-	2
	CO34OCP01	<i>Computer Application Practical Examination</i> for Information Technology for Office and Information technology for Business	2	NA
	CO4OCT03	Co-operation- Management of Co-operative Enterprises	4	5
	CO4OCT04	Travel and Tourism- Travel and Tourism Infrastructure	4	5
	CO4OCT05	Marketing- Services Marketing	4	5
		TOTAL for streams other than Computer Application	19	25
		TOTAL for Computer Application Stream	20	25

Semester- 5

Sl No	Course Code	Course Name	Credit	Hours per week
1	CO5CRT14	Cost Accounting - 1	4	6
2	CO5CRT15	Environment Management and Human Rights	4	5
3	CO5CRT16	Financial Management	4	5
4		Optional - 3		
	CO5OCT01	Finance and Taxation- Income Tax- I	4	5
	CO5OCT02	Computer Application-	3	3

		Computerised Accounting(Theory)		
		Computerised Accounting (Practical)- Examination in 6th Semester only	-	2
	CO5OCT03	Co-operation- Co-operative Legal System	4	5
	CO5OCT04	Travel and Tourism- Hospitality Management	4	5
	CO5OCT05	Marketing- Marketing Research	4	5
5		Open Course	3	4
		TOTAL for streams other than Computer Application	19	25
		TOTAL for Computer Application stream	18	25

Semester- 6

Sl No	Course Code	Course Name	Credit	Hours per week
1	CO6CRT17	Cost Accounting - 2	4	6
2	CO6CRT18	Advertisement and Sales Management	3	4
3	CO6CRT19	Auditing and Assurance	4	5
4	CO6CRT20	Management Accounting	4	5
5	CO6OCT	Optional - 4	4	5
	CO6OCT01	Finance and Taxation- Income Tax- II	4	5
	CO6OCT02	Computer Application- Software for Business and Research (Theory)	3	3
		Software for Business and Research(Practical)	-	2
	CO56OCP01	Computer Application- Practical Examination – Computerised Accounting and Software for Business and Research	2	NA
	CO6OCT03	Co-operation- Accounting for Co-operative Societies	4	5
	CO6OCT04	Travel and Tourism- Tourism and Cultural Heritage of India	4	5
	CO6OCT05	Marketing- International Marketing	4	5
6	CO6PR01	Project and Viva	1	-
		TOTAL for streams other than Computer Application	20	25
		TOTAL for Computer Application	21	25

Module III

Accounting and Control of Labour Cost- Time Keeping and Time Booking-Methods - Systems of Wage Payment-Time Rate System- Piece Rate System- Differential Piece Rate – Taylor’s differential piece rate system- Merrick’s differential piece rate system- Gantt Task and Bonus plan- Incentive Plans- Halsey Plan - Rowan Plan-Idle Time- Overtime and their Accounting Treatment- Labour Turnover- Causes and effects- Methods of Calculating Labour Turnover. **(20 Hours)**

Module IV

Accounting for Overhead-Classification of Overhead- Segregation of semi variable overhead- Production overhead- Allocation and apportionment- Primary and Secondary Distribution Summary- Absorption of Overhead- Methods of absorption of overheads- Overhead absorption rates- Actual and pre-determined rates- Blanket and Multiple rates- Over-absorption and Under-absorption- Reasons- Disposal- Introduction to Activity Based Costing (Problems of ABC excluded) **(25 Hours)**

Module V

Preparation of Cost Sheet- Cost sheet- Objectives- preparation- Tender and Quotation-Reconciliation Statement –Need- Reasons for disagreements in Profits-Preparation- Memorandum Reconciliation Account **(20 Hours)**

Suggested Readings

1. Jain, S.P., & Narang, K.L., Advanced Cost Accounting, *Kalyani Publishers, New Delhi.*
2. Iyengar, S. P., Cost Accounting, *Sultan Chand & Sons, New Delhi.*
3. Maheswari, S.N., Advanced Cost Accounting, *Sultan Chand & Sons, New Delhi.*
4. Arora, M. N., Cost Accounting, *Vikas Publishing House Pvt. Ltd, New Delhi.*
5. J Madegowda, Advanced Cost accounting, *Himalaya Publishing House, Mumbai*
6. Shukla, M.C., and Grewal, T.S., Cost Accounting, *Sultan Chand & Sons, New Delhi.*
7. Lall Nigam B M and Jain I C, Cost Accounting Principles and Practice, Prentice Hall of India

Core Course 15: ENVIRONMENT MANAGEMENT AND HUMAN RIGHTS

Instructional Hours: 90

Credit: 4

Module I (18 Hours)

Unit 1 : Multidisciplinary nature of environmental studies (2 Hours)

Definition, scope and importance -need for public awareness.

Unit 2 : Natural Resources :

Renewable and non-renewable resources : Natural resources and associated problems.

Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. -**Water resources** : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. **Mineral resources** : Use and exploitation, environmental effects of extracting and using mineral resources, case

studies. **Food resources** : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. **Energy resources**: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies. **Land resources**: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Role of individual in conservation of natural resources- Equitable use of resources for sustainable life styles.

(10 Hours)

Unit 3: Ecosystems

Concept of an ecosystem -Structure and function of an ecosystem -Producers, consumers and decomposers- Energy flow in the ecosystem -Ecological succession-Food chains, food webs and ecological pyramids-Introduction, types, characteristic features, structure and function of the given ecosystem:- Forest ecosystem (6 Hours)

Module II (26 hours)

Unit 1: Biodiversity and its conservation

- Introduction –Bio geographical classification of India -Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values-India as a mega-diversity nation-Hot-spots of biodiversity-Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts-Endangered and endemic species of India

(8 Hours)

Unit 2: Environmental Pollution

Definition, Causes, effects and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management: Causes, effects and control measures of urban and industrial wastes-Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides.

(8 Hours)

Unit 3: Social Issues and the Environment

Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people: its problems and concerns, Case studies, Environmental ethics: Issues and possible solutions,-Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies- Consumerism and waste products- Environment Protection Act - Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness

(10 Hours)

Module – III (15 Hours)

Recent developments- Green Accounting- Meaning- History- Scope and Importance- Importance- Advantages and limitations- Green Banking- Meaning- benefits- coverage- steps in green banking- environmental risks for banks- Green banking initiatives- International initiatives- Initiatives in India- Green Marketing- Meaning- Need and benefits- Challenges-

Green marketing in India- Green washing and consequences- Eco tourism- significance- eco tourism activities in India- Opportunities and challenges – carbon credit and carbon exchanges (over view only) - Environmental audit- concept- need and scope (15 Hours)

Module – IV (13 Hours)

Right to Information Act 2005- Basic terms- Public authority- Competent authority- Appropriate Government- Third Part- Information – record- Right to information- Objectives of the Act- Features of the Act- Obligation of Public authority- Procedure for request of information- time limit- fee- ground of rejection- appeal- exemption from disclosure- Right to access information on specific issues- Banking transactions, insurance transactions, government dealing and related services (13 Hours)

Module – V (18 Hours)

Unit 1- Human Rights– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).

Unit-2 Human Rights and United Nations – contributions, main human rights related organs UNESCO, UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights.

Human Rights in India – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities

Unit-3 Environment and Human Rights - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment

Conservation of natural resources and human rights: Reports, Case studies and policy formulation. Conservation issues of Western Ghats- mention Gadgil committee report, Kasthurirangan report. Over exploitation of ground water resources, marine fisheries, sand mining etc. (18 Hours)

Assignment may include Field study involving

- Visit to a local area to document environmental grassland/ hill /mountain
- Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc
- Study of simple ecosystem-pond, river, hill slopes, etc

Suggested Readings

1. Bharucha Erach, Text Book of Environmental Studies for undergraduate Courses. University Press, IInd Edition 2013 (TB)
2. Clark.R.S., Marine Pollution, Clanderson Press Oxford (Ref)

BCOM- Model-III

Semester – III

Type of Course	Course Code	Name of the Paper
Core	CM03BAA01	Marketing Management
Core	CM03BAA02	Financial Accounting
Core	CM03BAA04	Business management
Common Core - III	CM03BAA03	E-Commerce and General Informatics
Vocational Core - I	CM03BBA02	Information Technology for Business
Complementary	CM03CAC01	Income Tax law and Practice

Semester – IV

Type of Course	Course Code	Name of the Paper
Core	CM04BAA01	Capital Market
Core	CM04BAA02	Corporate Accounting
Core	CM04BAA03	Financial Service
Common Core - IV	CM04BA901	Entrepreneurship Development and Project Management
Vocational Core -II	CM04BBA02	Information Technology for Office
Complementary	CM04CAC03	Income Tax Assessment and Procedure

Semester –V

Type of Course	Course Code	Name of the Paper
Core	CM05BAA01	Cost Accounting
Core	CM05BAA02	Special Accounting
Vocational Core-III	CM05CAB02	Programming in C Language

Vocational Core-IV	CM05BBA02	Computerised Accounting
Open	EM05DAP05	Business Economics

Semester –VI

Type of Course	Course Code	Name of the Paper
Core	CM06BAA01	Applied Cost Accounting
Core	CM06BAA02	Practical Auditing
Core	CM06BAA03	Accounting for Managerial Decisions
Core	CM06CAB02	Commerce - Programme with Visual Basic 6.0
Core	CM06BFA01	Project and Viva
Core	CM06CAC01	Secretarial Practice

കോഴ്സ് വിവരങ്ങൾ

മോഡൽ 1 ബി.എ.മലയാളം പാഠ്യപദ്ധതി

സെമസ്റ്റർ	കോഴ്സ് കോഡ്	കോഴ്സിന്റെ പേര്	കോഴ്സ് ഇനം	കോഴ്സ് സമയം (ആഴ്ചയിൽ)	ക്രെഡിറ്റ്	മാർക്ക്	
						ഇന്റേണൽ	എക്സ്റ്റേണൽ
I	ML1CCT01	കഥാസാഹിത്യം	കോമൺ	4 മണിക്കൂർ	4	20	80
	ML1CRT01	നവീനകവിത	കോർ	4 മണിക്കൂർ	4	20	80
	ML1CMT01	മലയാളപഠനത്തിന്റെ രീതിശാസ്ത്രം	കോംപ്ലിമെന്ററി	4 മണിക്കൂർ	3	20	80
	ML1CMT02	നാടകവും സിനിമയും	കോംപ്ലിമെന്ററി	4 മണിക്കൂർ	3	20	80
II	ML2CCT02	കവിത	കോമൺ	4 മണിക്കൂർ	4	20	80
	ML2CRT02	മലയാളകവിത എഴുത്തച്ഛൻ മുതൽ കവിത്രയം വരെ	കോർ	4 മണിക്കൂർ	4	20	80
	ML2CMT03	ആധുനിക ലോകകവിത	കോംപ്ലിമെന്ററി	4 മണിക്കൂർ	3	20	80
	ML2CMT04	ഫോക്ലോർ വിജ്ഞാനം	കോംപ്ലിമെന്ററി	4 മണിക്കൂർ	3	20	80
III	ML3CCT03	ദൃശ്യകലാസാഹിത്യം	കോമൺ	5 മണിക്കൂർ	4	20	80
	ML3CRT03	കേരളസംസ്കാരം-പൂർവ്വഘട്ടം	കോർ	5 മണിക്കൂർ	4	20	80
	ML3CMT05	ഒരു എഴുത്തുകാരൻ/ എഴുത്തുകാരി -മാധവിക്കുട്ടി	കോംപ്ലിമെന്ററി	4 മണിക്കൂർ	3	20	80
	SC3CMT01	സംസ്കൃതം- Poetry, Rhetorics & Basics of Grammar	കോംപ്ലിമെന്ററി	6 മണിക്കൂർ	4	20	80

സെമസ്റ്റർ	കോഴ്സ് കോഡ്	കോഴ്സിന്റെ പേര്	കോഴ്സ് ഇനം	കോഴ്സ് സമയം (ആഴ്ചയിൽ)	ക്രെഡിറ്റ്	മാർക്ക്	
						ഇന്റേണൽ	എക്സ്ട്രേണൽ
IV	ML4CCT04	മലയാളഗദ്യരചനകൾ	കോമൺ	5 മണിക്കൂർ	4	20	80
	ML4CRT04	കേരളസംസ്കാരം-ഉത്തര ഘട്ടം	കോർ	5 മണിക്കൂർ	4	20	80
	ML4CMT06	ആധുനിക മലയാളഭാഷ	കോംപ്ലിമെന്ററി	4 മണിക്കൂർ	3	20	80
	SC3CMT02	സംസ്കൃതം -Prose, Vrutha, Alankara, Theories of Poetics & Grammar	കോംപ്ലിമെന്ററി	6 മണിക്കൂർ	4	20	80
V	ML5CRT05	പരിസ്ഥിതിവിജ്ഞാനവും മനുഷ്യാവകാശപഠനവും	കോർ	4 മണിക്കൂർ	4	20	80
	ML5CRT06	സാഹിത്യമീമാംസ	കോർ	6 മണിക്കൂർ	4	20	80
	ML5CRT07	ചെറുകഥ നോവൽ	കോർ	6 മണിക്കൂർ	4	20	80
	ML5CRT08	ഭാഷാശാസ്ത്രം	കോർ	5 മണിക്കൂർ	4	20	80
	ഓപ്പൺ കോഴ്സ്		ഓപ്പൺ	4 മണിക്കൂർ	3	20	80
	ML5OPT01	പത്രപ്രവർത്തനം					
	ML5OPT02	മാധ്യമപഠനം					
	ML5OPT03	ചലച്ചിത്രസാമ്രാജ്യവും തിരക്കഥാരചനയും					
VI	ML6CRT09	കേരളീയദൃശ്യകല	കോർ	5 മണിക്കൂർ	4	20	80
	ML6CRT10	പ്രാചീനസാഹിത്യം	കോർ	5 മണിക്കൂർ	4	20	80
	ML6CRT11	ഗദ്യസാഹിത്യം നിരൂപണം	കോർ	5 മണിക്കൂർ	4	20	80
	ML6CRT12	വ്യാകരണം, ഭാഷാചരിത്രം	കോർ	5 മണിക്കൂർ	4	20	80
	കോർ ഇലക്ടീവ്		ഇലക്ടീവ്	5 മണിക്കൂർ	4	20	80
	ML6CBT01	മലയാളത്തിലെ സ്ത്രീരചനകൾ					
	ML6CBT02	മാധ്യമവിജ്ഞാനീയം					
	ML6CBT03	സംസ്കാരപഠനം					
ML6PRT01	പ്രോജക്ട്	പ്രോജക്ട്		1	20	80	

ബി.എ. മലയാളം
സെമസ്റ്റർ 5 കോർ കോഴ്സ്
കോഴ്സ് കോഡ് : ML5CRT05

പരിസ്ഥിതിവിജ്ഞാനവും മനുഷ്യാവകാശപഠനവും

ദർശനം

1. പരിസ്ഥിതി ശാസ്ത്രത്തിന്റെയും പഠനത്തിന്റെയും പ്രാധാന്യം തർക്കമില്ലാത്തതാണ്.
2. അഭംഗുരവികസനത്തിന്റെ ആവശ്യകതയാണ് മനുഷ്യവംശത്തിന്റെ ഭദ്രമായ ഭാവിയുടെ താക്കോൽ
3. ഇന്നും നിലനിൽക്കുന്ന മലീനീകരണപ്രശ്നങ്ങളും ഖരമാലിന്യനിർമ്മാർജ്ജനവും പരിസ്ഥിതി അധഃപതനവും സാമ്പത്തിക ഉല്പാദനശേഷിയും രാഷ്ട്രസുരക്ഷാവിഷയങ്ങളും ആഗോളതാപനവും ഓസോൺപാളികളുടെ ശോഷണവും ജൈവവൈവിധ്യത്തിലുള്ള നഷ്ടവും എല്ലാം തന്നെ നമ്മെ പാരിസ്ഥിതിക വിഷയങ്ങളുടെ പ്രസക്തി ബോധ്യപ്പെടുത്തുന്നു.
4. 1992-ൽ റയോവിൽ നടന്ന ഐക്യരാഷ്ട്രസഭയുടെ പരിസ്ഥിതി-വികസനസമ്മേളനവും 2002-ൽ ജൊഹാനസ് ബർഗിൽ നടന്ന അഭംഗുരവികസനത്തെപ്പറ്റിയുള്ള ലോകസമ്മേളനവും നമ്മുടെ ശ്രദ്ധയെ പരിസ്ഥിതി നേരിടുന്ന നശീകരണവിപത്തിലേക്ക് തിരിച്ചുവിടുന്നു.
5. വളരെ വ്യക്തമായ ഒരുകാര്യം, പാരിസ്ഥിതിക വിഷയങ്ങളെക്കുറിച്ചുള്ള അജ്ഞത ഒരു ലോകപൗരനും വെച്ചുപുലർത്താൻ പാടില്ല എന്നതാണ്. ജൈവ വൈവിധ്യത്തിന്റെ കാര്യത്തിൽ വളരെ സമ്പന്നമായ ഒരു രാഷ്ട്രമാണ് ഇന്ത്യ. പലതരം വിഭവങ്ങൾ ഈ വൈവിധ്യത്തിൽ നിന്നും നമുക്ക് ലഭ്യമാണ്.

എന്നാൽ ലോകമാകെയുള്ള കണക്കനുസരിച്ച് 1.7 ദശലക്ഷം ജീവജാലങ്ങളെ മാത്രമേ ശാസ്ത്രം വർഗ്ഗീകരിച്ച് വേറിട്ട് വിവരിച്ചിട്ടുള്ളൂ. ഇനിയും ഒരുപാട് ജീവജാലങ്ങളെ വർഗ്ഗീകരിക്കേണ്ടതായിട്ടുണ്ട്. ഇവയെല്ലാം തന്നെ ex-situ, in-situ ക്രമങ്ങളിൽ സംരക്ഷിക്കാനുള്ള ശ്രമങ്ങളും നടന്നുവരുന്നുണ്ട്. ഈ സാഹചര്യത്തിലാണ് ഇന്ത്യപോലുള്ള ജൈവവൈവിധ്യ സമ്പന്നമായ രാജ്യങ്ങളിൽ ബൗദ്ധികസ്വത്തവകാശനിയമങ്ങൾ പ്രസക്തമാകുന്നത്. ഗണപരമായ ഉപയോഗസവിശേഷതകളുള്ള മൃഗങ്ങളെയും സസ്യങ്ങളെയും സൂക്ഷ്മാണുക്കളെയും സംരക്ഷിക്കുന്നതിനു വേണ്ടിയാണിത്.

വാസസ്ഥലനശീകരണവും ഊർജ്ജസ്രോതസ്സുകളുടെ അമിതഉപയോഗവും പാരിസ്ഥിതിക മലീനീകരണവും കൂടിച്ചേർന്ന് ഒരുപാട് ജീവജാലങ്ങളെ ഭൂമിയിൽ നിന്ന് തുടച്ചു നീക്കിയിട്ടുണ്ട്. തുടർന്നും ഒരുപാട് ജീവജാലങ്ങൾ സമീപഭാവിയിൽ അപ്രത്യക്ഷമാകുമെന്ന ഭീഷണിയും നിലനിൽക്കുന്നു. ഈയൊരുസാഹചര്യത്തിൽ പോലും നമ്മുടെ പാഠ്യപദ്ധതികളിൽ പാരിസ്ഥിതികപഠനങ്ങൾക്ക് വേണ്ടത്ര ഊന്നൽ ലഭിച്ചിട്ടില്ല. ഇതു കണക്കിലെടുത്തുകൊണ്ടാണ് ഉന്നതവിദ്യാഭ്യാസത്തിന്റെ എല്ലാതലങ്ങളിലും പരിസ്ഥിതി പഠനം ഒരു അടിസ്ഥാനവിഷയമായി ഉൾപ്പെടുത്തണമെന്ന് ബഹു സുപ്രീംകോടതി യു.ജി.സി.ക്കു നിർദ്ദേശം നൽകുന്നത്.

ഇതിന്റെ ചുവടുപിടിച്ചാണ് ഇന്ത്യയിലെ എല്ലാ സർവ്വകലാശാലകളിലും കോളേജുകളിലും ആറുമാസം ദൈർഘ്യമുള്ള പരിസ്ഥിതി പഠനകോർമൊഡ്യൂൾ കോഴ്സ് നിർബന്ധമായും ഉണ്ടായിരിക്കണമെന്ന് യു.ജി.സി. നിഷ്കർഷിക്കുന്നത്.

മനുഷ്യാവകാശപഠനം ഉൾപ്പെടെ അഞ്ച് മൊഡ്യൂളുകളാണ് പാഠ്യപദ്ധതിയിൽ ഉണ്ടാവുക. ആദ്യരണ്ട് മൊഡ്യൂളുകൾ യു.ജി.സി.നിർദ്ദേശങ്ങൾ അനുസരിച്ചുള്ള പരിസ്ഥിതി പഠനമാണ്. തുടർന്നുള്ള രണ്ട് മൊഡ്യൂളുകൾ അതതു ഐക്യരാഷ്ട്രസഭയുടെ വിഷയങ്ങളുമായി ബന്ധപ്പെടുത്തി വികസിപ്പിച്ചെടുക്കേണ്ടതുമാണ്. അഞ്ചാമത്തെ മൊഡ്യൂൾ മനുഷ്യാവകാശമെന്ന വിഷയത്തെ അഭിസംബോധന ചെയ്യുന്നു.

ലക്ഷ്യങ്ങൾ

1. പരിസ്ഥിതിപഠനവും, പരിസ്ഥിതിക സംഭവങ്ങളും എന്തുകൊണ്ട്, എങ്ങനെ ഉരുത്തിരിയുന്നുവെന്ന് അന്വേഷിക്കാനും അതിൽ ഗവേഷണം ചെയ്യാനും വിദ്യാർത്ഥികളെ പ്രോത്സാഹിപ്പിക്കുന്നു; സങ്കീർണ്ണമായ പാരിസ്ഥിതികവിഷയങ്ങളെക്കുറിച്ച് സ്വന്തമായ തീരുമാനങ്ങളിലെത്താൻ ആവശ്യമായ വിമർശനാത്മകവും ക്രിയാത്മകവുമായ വിശകലന കഴിവുകൾ രൂപീകരിക്കാനും വികസിപ്പിക്കാനും ഇത്തരം പഠനങ്ങൾ വിദ്യാർത്ഥികളെ സഹായിക്കുന്നു. ഇതുവഴി പരിസ്ഥിതി ബോധ്യമുള്ള പുതിയ തലമുറയെ (ഉപഭോക്താക്കൾ, തൊഴിലാളികൾ, നിയമനിർമ്മാതാക്കൾ) വാർത്തെടുക്കാൻ സാധിക്കും.
2. തങ്ങളുടെ തീരുമാനങ്ങളും പ്രവൃത്തികളും എങ്ങനെ പരിസ്ഥിതിയെ ബാധിക്കുന്നുവെന്ന് വിദ്യാർത്ഥികളെ ബോധവൽക്കരിക്കാനും പരിസ്ഥിതികപ്രശ്നങ്ങളെ പരിഹരിക്കാനും ആവശ്യമായ ജ്ഞാനവും കർമ്മപരിപാടികളും ഇതുവഴി വികസിപ്പിച്ചെടുക്കാനാകും. അഭംഗ്യരവും ആരോഗ്യകരവുമായ പരിസ്ഥിതിഭാവിയീലും നിലനിൽക്കുന്നതിനുവേണ്ടി സ്പഷ്ടമായ മൂല്യബോധങ്ങൾ വിദ്യാർത്ഥികളിൽ വളർത്തിയെടുക്കാനാകും.
3. മനുഷ്യനും പരിസ്ഥിതിയും തമ്മിലുള്ള അടിസ്ഥാനപരമായ ബന്ധവും വിദ്യാർത്ഥികളിൽ ആശയപരമായി ഉറപ്പിച്ചെടുക്കാനും അതുവഴി പ്രകൃതിയേയും പ്രകൃതിവിഭവങ്ങളേയും സംരക്ഷിക്കുക എന്ന ദൗത്യത്തിന്റെ പ്രസക്തി അവരിലേക്ക് പകർന്നു കൊടുക്കാനും ആകും.
4. പരിസ്ഥിതി പരിപാലനം ഒരു സാമൂഹിക കടമയാണെന്ന ബോധം വിദ്യാർത്ഥികളിൽ വളർത്തിയെടുക്കാനാകും.

മൊഡ്യൂൾ 1

യൂണിറ്റ് -1 പരിസ്ഥിതിപഠനത്തിന്റെ ബഹുവിജ്ഞാനീയ സ്വഭാവം

നിർവ്വചനങ്ങൾ-സാധ്യതകളും പ്രാധാന്യവും- സാമൂഹികഅവബോധത്തിന്റെ ആവശ്യകത- 2 മണിക്കൂർ

യൂണിറ്റ് -2 പ്രകൃതിദത്ത വിഭവങ്ങൾ

പുനരുദ്ധരിക്കാവുന്നതും അല്ലാത്തതുമായ വിഭവങ്ങൾ-പ്രകൃതിദത്തവിഭവങ്ങളും അനുബന്ധപ്രശ്നങ്ങളും

എ)വനവിഭവം-ഉപയോഗവും അമിതചൂഷണവും- വനനശീകരണം-മരംവെട്ടൽ-ഖനനം- അണക്കെട്ടുകളും അവ മൂലം കാടുകൾക്കും ആദിവാസികൾക്കും ഉണ്ടാകുന്ന പ്രശ്നങ്ങൾ (കേസ് പഠനം).

ബി) ജലവിഭവങ്ങൾ- ഉപരിതല ജലസ്രോതസ്സുകളുടെയും ഭൂഗർഭജലസ്രോതസ്സുകളുടെയും ഉപയോഗവും അമിത ഉപയോഗവും-പ്രളയം-വരൾച്ച-ജലസംഘർഷം- അണക്കെട്ടുകൾ: ഗുണങ്ങൾ, ദോഷങ്ങൾ (കേസ് പഠനം)

സി)ധാതുവിഭവങ്ങൾ-ഉപയോഗവും ചൂഷണവും ധാതുവിഭവങ്ങളുടെ ഖനനവും ഉപയോഗവും സൃഷ്ടിക്കുന്ന പാരിസ്ഥിതിക ഭവിഷ്യത്തുകൾ (കേസ് പഠനം).

ഡി) ഭക്ഷ്യവിഭവങ്ങൾ- കൃഷി മൂലമുണ്ടാകുന്ന ലോകഭക്ഷ്യവ്യതിയാനങ്ങളും പ്രശ്നങ്ങളും- അമിതമായ പുൽമേച്ചിൽ- ആധുനികകൃഷിയുടെ അനന്തരഫലങ്ങൾ- വളങ്ങളും കീടനാശിനികളും മൂലമുള്ള പ്രശ്നങ്ങൾ- വെള്ളക്കെട്ട്-ജലലവണതം(കേസ് പഠനം)

ഇ)ഊർജ്ജവിഭവങ്ങൾ- വിർദ്ധിച്ചുവരുന്ന ഊർജ്ജ ആവശ്യകത-പുനരുദ്ധരിക്കാവുന്നതും അല്ലാത്തതുമായ ഊർജ്ജസ്രോതസ്സുകൾ- ബദൽ ഊർജ്ജസ്രോതസ്സുകൾ (കേസ് പഠനം)

എഫ്) മൺ വിഭവങ്ങൾ- മണ്ണ് വിഭവമാകുമ്പോൾ-മണ്ണ് അപകർഷിക്കൽ മനുഷ്യപ്രേരിത മണ്ണിടിച്ചിൽ- മരുവൽക്കരണം (കേസ് പഠനം)

പ്രകൃതി വിഭവസംരക്ഷണത്തിൽ വ്യക്തികളുടെ പങ്ക്

തൂല്യവിഭവവിഭജനവും നിലനിർത്താവുന്ന ജീവിതശൈലികളും 10 മണിക്കൂർ

യൂണിറ്റ് 3 പരിസ്ഥിതിവ്യൂഹം-പരിസ്ഥിതി വ്യൂഹം എന്ന ആശയം-അതിന്റെ ഘടനയും പ്രവർത്തനവും -ഉല്പാദകർ, ഉപഭോക്താക്കൾ, വിഘടകവിഭവിക്കുന്നവർ-പരിസ്ഥിതി വ്യൂഹത്തിലെ ഊർജ്ജ ഒഴുക്കുകൾ -പരിസ്ഥിതിവ്യൂഹത്തിന്റെ തുടർച്ചകൾ-ഭക്ഷ്യചങ്ങലകൾ-

ഭക്ഷ്യവലകൾ-പാരിസ്ഥിതികപിരമിഡുകൾ: തരംതിരിവുകൾ, ഗണങ്ങൾ, സവിശേഷസ്വഭാവങ്ങൾ വനപരിസ്ഥിതി വ്യൂഹത്തിന്റെ ഘടനയും പ്രവർത്തനവും 6 മണിക്കൂർ

മൊഡ്യൂൾ -2

യൂണിറ്റ്-1 ജൈവവൈവിധ്യവും ജൈവവൈവിധ്യ സംരക്ഷണവും-പ്രാരംഭ അവതരണം-ഇന്ത്യയുടെ ജൈവ-ഭൂമിശാസ്ത്രവർഗ്ഗീകരണം- ജൈവവൈവിധ്യത്തിന്റെ മൂല്യം-ഉപഭോഗകേന്ദ്രിതവും ഉത്പ്പാദന കേന്ദ്രിതവുമായ ഉപയോഗങ്ങൾ-സാമൂഹികവും ധാർമ്മികവും ക്രിയാത്മകവുമായ മൂല്യസാധ്യതകൾ-ഇന്ത്യ ഒരു ബൃഹദ് വൈവിധ്യരാജ്യം എന്ന നിലയിൽ-ജൈവവൈവിധ്യത്തിന്റെ തീച്ചുകളുകൾ(Hotspot)- ജൈവവൈവിധ്യം നേരിടുന്ന ഭീഷണികൾ- ആവാസസ്ഥലനശീകരണം- അനധികൃത വന്യമൃഗവേട്ടയാടൽ-മനുഷ്യ-വന്യമൃഗസംഘർഷങ്ങൾ- ഇന്ത്യയിൽ വംശനാശഭീഷണി നേരിടുന്ന മൃഗങ്ങളും പക്ഷികളും സസ്യങ്ങളും 8 മണിക്കൂർ

യൂണിറ്റ് 2- പരിസ്ഥിതിമലിനീകരണം - നിർവ്വചനങ്ങൾ-മലിനീകരണത്തിന്റെ കാരണങ്ങൾ, ഭവിഷ്യത്തുകൾ, നിയന്ത്രണ നടപടികൾ: വായുമലിനീകരണം, ജലമലിനീകരണം, മണ്ണ് മലിനീകരണം, സമുദ്രമലിനീകരണം, ശബ്ദമലിനീകരണം, താപമലിനീകരണം, ആണവഅപകടങ്ങൾ.

ഖരമാലിന്യനിർമ്മാർജ്ജനം-നാഗരികവും വ്യാവസായികവുമായ മാലിന്യഉല്പാദനത്തിന്റെ കാരണവും ഭവിഷ്യത്തും നിയന്ത്രണനടപടികളും-മാലിന്യനിവാരണത്തിൽ വ്യക്തികളുടെ പങ്ക് (മലിനീകരണ കേസ് പഠനം).

ദുരന്തനിവാരണം-പ്രളയം, ഭൂചലനം, ചുഴലിക്കാറ്റ്, മണ്ണിടിച്ചിൽ. 8 മണിക്കൂർ

യൂണിറ്റ് -3 പരിസ്ഥിതിയും സാമൂഹികവിഷയങ്ങളും -ഊർജ്ജസ്രോതസ്സുകളുമായി ബന്ധപ്പെട്ട നാഗരിക പ്രശ്നങ്ങൾ- ജലസംരക്ഷണം-മഴവെള്ള സംഭരണം- വെള്ളക്കെട്ട് നിയന്ത്രണം- ജനങ്ങളെ മാറ്റി പാർപ്പിക്കലും പുനരധിവാസവും-ആശങ്കകൾ പ്രശ്നങ്ങൾ (കേസ് പഠനം).

പാരിസ്ഥിതിക നീതിബോധം- വിഷയങ്ങളും പരിഹാരസാധ്യതകളും- കാലാവസ്ഥാ വ്യതിയാനം-ആഗോളതാപനം-അമ്ലമഴ- ഓസോൺപാളികളുടെ നാശം- ആണവഅപകടങ്ങളും ദുരന്തങ്ങളും (കേസ് പഠനം)

ഉപഭോഗസംസ്കാരവും മാലിന്യപദാർത്ഥങ്ങളും -പരിസ്ഥിതി സംരക്ഷണനിയമം -വന്യജീവി സംരക്ഷണനിയമം-വനസംരക്ഷണനിയമം- പാരിസ്ഥിതിക നിയമനിർമ്മിതിയും നടപ്പിലാക്കലും -പ്രശ്നങ്ങളും പൊതുബോധവും 10 മണിക്കൂർ.

മോഡ്യൂൾ 3

കാലികപ്രസക്തവും രാഷ്ട്രീയചിന്ത , സൗന്ദര്യശാസ്ത്രം, സാഹിത്യദർശനം, സാമൂഹിക വിഷയങ്ങൾ എന്നിവയെ സ്വാധീനിക്കുന്നതുമായ പരിസ്ഥിതി ബോധം -2 ലേഖനങ്ങൾ

- 1. പരിസ്ഥിതി സൗന്ദര്യശാസ്ത്രത്തിന് ഒരു മുഖവുര-ടി.പി. സുകുമാരൻ
 - 2. പരിസ്ഥിതി ലാവണ്യശാസ്ത്രം ഒരു ദിശാസൂചിക -ഡി.വിനയചന്ദ്രൻ
- (ഈ ലേഖനങ്ങൾ ഹരിതനിരൂപണം മലയാളത്തിൽ എന്ന പുസ്തകത്തിലുണ്ട്)10 മണിക്കൂർ.

മൊഡ്യൂൾ -4

പാരിസ്ഥിതിക സംവേദനവും പഠനവും 2 ലേഖനം

- 1. ഇദം ന മമഃ -നരേന്ദ്രപ്രസാദ് (ഹരിതനിരൂപണം മലയാളത്തിൽ)
- 2.നോർവെയിൽ നിന്നും ഒരു പർവതസ്തവം-ആഷാമേനോൻ (ഖാൽസയുടെ ജലസ്മൃതികൾ)

10 മണിക്കൂർ.

മൊഡ്യൂൾ-5

മനുഷ്യാവകാശങ്ങൾ

യൂണിറ്റ് -1 അവതരണം- അർത്ഥം-ആശയം-ആശയവിപുലീകരണം

മനുഷ്യാവകാശബോധത്തിന്റെ മൂന്നുതലമുറകൾ-പൗരാവകാശങ്ങൾ, രാഷ്ട്രീയാവകാശങ്ങൾ, സാമ്പത്തികാവകാശങ്ങൾ, സാമൂഹികാവകാശങ്ങൾ,സാംസ്കാരികാവകാശങ്ങൾ.

യൂണിറ്റ് -2

മനുഷ്യാവകാശങ്ങളും ഐക്യരാഷ്ട്രസംഘടനയും- ഐക്യരാഷ്ട്രസംഘടനയുടെ സംഭാവനകൾ-ഐക്യരാഷ്ട്രസംഘടനയുടെ പ്രധാനപ്പെട്ട മനുഷ്യാവകാശസംബന്ധിയായ സ്ഥാപനങ്ങൾ-യൂനെസ്കോ, യൂണിസെഫ്, ഡബ്ല്യുഎച്ച്. ഒ., ഐ.എൽ.ഒ.-സ്ത്രീകളെയും കുട്ടികളെയും സംബന്ധിച്ച പ്രഖ്യാപനങ്ങൾ-മനുഷ്യാവകാശത്തെ സംബന്ധിച്ച സാർവ്വലൗകിക പ്രഖ്യാപനങ്ങൾ- മനുഷ്യാവകാശ ധാരണകളും ഇന്ത്യയും-ഇന്ത്യൻ ഭരണഘടനയും മൗലികാവകാശങ്ങളും-സ്ത്രീകളുടെയും കുട്ടികളുടെയും അവകാശങ്ങൾ-പട്ടികജാതി പട്ടികവർഗ്ഗ മറ്റു പിന്നോക്കസമുദായങ്ങൾ -ന്യൂനപക്ഷ സമുദായങ്ങൾ.

യൂണിറ്റ് -3

മനുഷ്യാവകാശവും പരിസ്ഥിതിയും-ശുദ്ധപരിസ്ഥിതിലഭ്യതാവകാശം- പൊതുസുരക്ഷ അവകാശം- വ്യാവസായിക മലിനീകരണപ്രശ്നങ്ങൾ

നവസാങ്കേതികവിദ്യകളുമായി ബന്ധപ്പെട്ട അപകടസാധ്യതകളും പ്രതിരോധനപടികളും സുരക്ഷാനടപടികളും പുനരധിവാസനടപടികളും മറ്റും

പ്രകൃതിദത്ത വിഭവസംരക്ഷണവും മനുഷ്യാവകാശവും-നയരൂപീകരണറിപ്പോർട്ടുകൾ (കേസ് പഠനം)

പശ്ചിമഘട്ടസംരക്ഷണവുമായി ബന്ധപ്പെട്ടവിഷയങ്ങൾ- ഗാഡ്ഗിൽ കമ്മിറ്റി റിപ്പോർട്ട്, കസ്തുരിരംഗൻ കമ്മിറ്റി റിപ്പോർട്ട് -ഭൂഗർഭജലവിഭവങ്ങളുടെ അമിതചൂഷണം- മണൽ ഖനനം-സമുദ്രമത്സ്യബന്ധനപ്രശ്നങ്ങൾ 8 മണിക്കൂർ

ഇന്റേണൽ

ഫീൽഡ് വർക്ക് -

1. പ്രാദേശികതലത്തിൽ സാധാരണ കാണപ്പെടുന്ന കിളികളെയും പ്രാണികളേയും സസ്യങ്ങളെയും കുറിച്ചുള്ള പഠനം

2. ലഘുപരിസ്ഥിതിവ്യൂഹപഠനം-കുളങ്ങൾ,നദികൾ, മലഞ്ചെരിവുകൾ തുടങ്ങിയവ

3. പ്രാദേശികമായ പരിസ്ഥിതിക വിവരശേഖരണത്തിനും ക്രോഡീകരണത്തിനും വേണ്ടിയുള്ള പഠനയാത്രകൾ- പുൽമേടുകൾ, കുന്നുകൾ, മലകൾ.

4.പ്രാദേശികമായി മലിനീകരിക്കപ്പെട്ട ഒരു സ്ഥലത്തേക്ക് പഠനയാത്ര(നാഗരികം, ഗ്രാമീണം, വ്യവസായ സ്ഥാപനങ്ങൾ, കൃഷിയിടങ്ങൾ)

(ഫീൽഡ് വർക്ക് 5 ലക്ഷർ മണിക്കൂറിനു തുല്യമാണ്)

അധ്യയനരീതി

1. ക്ലാസ് റൂം പഠനവും ഫീൽഡ് വർക്കും ഉൾപ്പെടുന്നതാണ് ഈ പാഠ്യപദ്ധതി. 72 ലക്ഷർമണിക്കൂറുകൾ ഉൾപ്പെടുത്തി വിഭാവനം ചെയ്തിരിക്കുന്ന 5 മൊഡ്യൂളുകൾ: ആദ്യത്തെ 2 മൊഡ്യൂളുകൾ അഭിരുചി രൂപീകരണത്തിനും അടിസ്ഥാന ജ്ഞാനം ആർജ്ജിക്കുന്നതിനും വേണ്ടിയുള്ള 44 ലക്ഷർ മണിക്കൂറുകളാണ്. മൂന്നും നാലും മൊഡ്യൂളുകൾ 20 ലക്ഷർ മണിക്കൂറുകളിലൂടെ അന്തർവൈജ്ഞാനികവികസനം ലക്ഷ്യമിടുന്നു. അഞ്ചാമത്തെ മൊഡ്യൂൾ 8 ലക്ഷർ മണിക്കൂറുകളിലൂടെ മനുഷ്യാവകാശം എന്ന ആശയത്തെ വിശദീകരിക്കാൻ ക്രമപ്പെടുത്തിയിട്ടുള്ളതാണ്.

2. ക്ലാസ് മുറികളിൽ നിന്നും പുറത്തേക്കുപോയുള്ള ഫീൽഡ് പഠനം എന്ന ഘടകം ഇന്റേണലിന്റെ ഭാഗമായി ഉൾപ്പെടുത്തിയിരിക്കുന്നത് ഇത്തരം പഠനയാത്രകളുടെ സമകാലിക പ്രസക്തിയിലും അതിന്റെ കാര്യക്ഷമതയിലും ഉള്ള ഉറച്ച വിശ്വാസം കൊണ്ടാണ്. ലക്ഷർ ക്ലാസ്സുകളോളം പ്രാധാന്യം ഇവ അർഹിക്കുന്നു. ഇത്തരം ഇടപെടലുകളിൽ അധ്യാപകർ വെറും പ്രചോദന ദാതാക്കളും വ്യാഖ്യാനദാതാക്കളും മാത്രമാണെന്ന് എടുത്തുപറയേണ്ടതില്ലല്ലോ.

3 ഈ പാഠ്യപദ്ധതിയുടെ നടത്തിപ്പുമായി ബന്ധപ്പെട്ട് യൂണിവേഴ്സിറ്റികൾക്കും കോളേജുകൾക്കും പുറത്തുനിന്നും വിദഗ്ധരുടെ ലക്ഷർകളും അനുബന്ധസഹായങ്ങളും തേടാവുന്നതാണ്.

B.A. Malayalam

Semester – III

Type of Course	Course Code	Name of the Paper
Core	MA03BA901	സമൂഹപരിണാമവുംസംസ്കാരചരിത്രവും ആധുനിക പുഴുവുകേരളം
Complentary	MA03CA901	കേരളത്തിന്റെ കൈവഴിത്താനിക പാഠവ്യവസ്ഥയും ആദ്യകാലകൈവഴിത്താനികസാഹിത്യവും
Complementary	SAD3CL001	Sanskrit I – Poetryand Grammer

Semester – IV

Type of Course	Course Code	Name of the Paper
Core	MA04BA901	സമൂഹപരിണാമവുംസംസ്കാരചരിത്രവും : ആധുനികകേരളം
Complementary	MA04CA901	കവ്യ സാഹിത്യകാരൻ/ സാഹിത്യകാരി - ലളിതാംബിക അന്തർലോകം
Complementary	MA04CA902	Sanskrit II – Kavya, Vatta, Alankara& Theories of Poetics.

Semester –V

Type of Course	Course Code	Name of the Paper
Core	MA05BA901	സാമാന്യ ഭാഷാശാസ്ത്രം
Core	MA05BA902	ഭാഷാസാഹിത്യ സിദ്ധാന്തങ്ങൾ
Core	MA05BA903	ഭാഷാഭേദകസാഹിത്യ സിദ്ധാന്തങ്ങൾ
Core	MA05BA904	കേരളീയ രംഗകല
open course		

Semester –VI (prior to 2017)

Type of Course	Course Code	Name of the Paper
Core	MA06BA901	കഥാസാഹിത്യം
Core	MA06BA902	ഗദ്യസാഹിത്യം, നിരൂപണം
Core	MA06BA903	പ്രാചീന മലയാളം പദ്യവുംഗദ്യവും
Core	MA06BA904	വ്യാകരണം, ഭാഷാചരിത്രം
Project	MA06BF901	Project
Choice based Course	MA06BB904	മലയാളത്തിലെ സ്ത്രീകചനകൾ

BA POLITICAL SCIENCE – MODEL 1

CATEGORY	SEMESTER	SUBJECT CODE	SUBJECT NAME	CREDIT
Common Course 1	I SEM	EN1CCT01	Fine Tune your English	4
Common Course 1	I SEM	EN1CCT02	Pearls from the Deep	3
Common Course 1	II SEM	EN1CCT03	Issues that Matter	4
Common Course 1	II SEM	EN1CCT04	Savouring the Classics	3
Common Course 1	III SEM	EN3CCT05	Literature and/as identity	4
Common Course 1	IV SEM	EN3CCT06	Illuminations	4
Complementary course	I SEM	HY1CMT01	Roots of the modern World	4
Complementary course	II SEM	HY1CMT04	History of Freedom movement in India	4
Complementary course	III SEM	EC3CMT01	Principles of Economics	4
Complementary course	IV SEM	EC3CMT02	Basic Economic Studies	4
Common Course 11	1 SEM	HN1CCT01	Hindi-Prose and One Act play	4
Common Course 11	1 SEM	ML1CCT01	Malayalam-Kadha Sahithyam	4
Common Course 11	1 SEM	SY1CCT01	Syriac-Poetry/Grammar History of Syriac language and Literature	4
Common Course 11	1 SEM	SK1CCT01	Sanskrit Poetry, Prose and Alankara	4
Common Course 11	2 SEM	ML2CCT02	Malayalam-Kavitha	4
Common Course 11	2 SEM	SY2CCT01	Syriac-Poetry/Grammar & history of Syriac literature	4
Common Course 11	2 SEM	SK2CCT02	Sanscrit-Communicative skills in Sanscrit language	4
Common Course 11	2 SEM	HN2CCT01	Hindi-Short Stories and novel	4
Common Course 11	3 SEM	ML3CCT03	Malayalam-DrusyakalaSahithyam	4
Common Course 11	3 SEM	HN3CCT01	Hindi-Poetry, Grammar and translation	4
Common Course 11	3 SEM	SY3CCT01	Syriac-Prose , Grammar and History of Syrian churches in India	4
Common Course 11	3 SEM	SK3CCT03	Churches in Indian Sanscrit- Poetry, Drama and translation	4
Common Course 11	4 SEM	ML4CCT04	Malayalam-Malayala Gadhyarachanakal	4
Common Course 11	4 SEM	HN4CCT01	Hindi-Drama and Long Poem	4
Common Course 11	4 SEM	SY4CCT01	Syriac-Prose, Grammar and History of Syrian Churches in india (From 15th Century)	4
Common Course 11	4 SEM	SK4CCT04	Sanscrit-Historical Survey of Sanscrit Languages and Kerala Culture	4
Core Course	I SEM	PS1CRT01	Methodology and Perspectives of political Science	5
Core Course	II SEM	PS2CRT02	Indian Constitution :Institutions and processes	4
Core Course	III SEM	PS3CRT03	Issues and Political processes in Modern India	4
Core Course	III SEM	PS3CRT04	Political Thought: Indian Traditions	4
Core Course	IV SEM	PS3CRT05	Introduction to Political Theory	4
Core Course	IV SEM	PS3CRT06	Political Thought: Western Traditions	4
Open Course	V SEM	PS5OPT01	Introduction to Defence and Strategic Studies	3
Core Course	V SEM	PS5CRT07	Theories and principles of Public Administration	4

Core Course	V SEM	PS5CRT08	Environmental Studies and human Rights	4
Core Course	V SEM	PS5CRT09	Methodology of research in Political Science	4
Core Course	V SEM	PS5CRT10	Introduction to International Relations	4
Core Course	VI SEM	PS6CRT11	Comparative Politics	4
Core Course	VI SEM	PS6CRT12	Society , State and Politics in Kerala	4
Core Course	VI SEM	PS6CRT13	Issues in international politics	4
Core Course	VI SEM	PS6CRT14	Human rights	4
Project 1	VI SEM	PS6PRT01		2
Choice Based core course	VI SEM	PS6CBT01	India's Foreign policy	4

COMPLEMENTARY COURSE TO ECONOMICS

CATEGORY	SEMESTER	SUBJECT NAME	SUBJECT CODE	CREDIT
Complementary Course	III SEM	An Introduction to Political Science	PS3CMT01	4
Complementary Course	IV SEM	Indian Constitution: Social Issues in India	PS4CMT05	4

CORE VIII: ENVIRONMENTAL STUDIES AND HUMAN RIGHTS

SIX MONTHS COMPULSORY CORE MODULE COURSE FOR UNDERGRADUATES

Teaching Methodologies

The core Module Syllabus for Environmental Studies includes class room teaching and Field Work. The syllabus is divided into five modules covering 72 lectures. The first two modules will cover 44 lectures which are class room based to enhance knowledge skills and attitude to environment. The third and fourth is based on subject related environmental studies which will be covered in 20 lecture hours and would provide student a multidisciplinary knowledge on environmental issues in relation with the core subject. Human rights is also included in the fifth module and 8 lectures are set apart for that. Field study is one of the most effective learning tools for environmental concerns and is purely for internal evaluation. This moves out of the scope of the text book mode of teaching into the realm of real learning in the field, where the teacher merely acts as a catalyst to interpret what the student observes or discovers in his/her own environment. Field studies are as essential as class work and form an irreplaceable synergistic tool in the entire learning process.

- Course material provided by UGC for class room teaching and field activities be utilized.
- The universities/colleges can also draw upon expertise of outside resource persons for teaching purpose.
- Environmental Core Module shall be integrated into the teaching programmes of all undergraduate courses.

Course Rationale: The importance of environmental science and environmental studies cannot be disputed. The need for sustainable development is a key to the future of mankind. Continuing problems of pollution, solid waste disposal, degradation of environment, issues like economic productivity and national security, Global warming, the depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues. The United Nations Conference on Environment and Development held in Rio de Janeiro in 1992 and World Summit on Sustainable Development at Johannesburg in 2002 have drawn the attention of people around the globe to the deteriorating condition of our environment. It is clear that no citizen of the earth can afford to be ignorant of environment issues.

India is rich in biodiversity which provides various resources for people. Only about 1.7 million living organisms have been described and named globally. Still many more remain to be identified and described. Attempts are made to conserve them in ex-situ and in-situ situations. Intellectual property rights (IPRs) have become important in a biodiversity-rich country like India to protect microbes, plants and animals that have useful genetic properties. Destruction of habitats, over-use of energy resource and environmental pollution have been found to be responsible for the loss of a large number of life-forms. It is feared that a large proportion of life on earth may get wiped out in the near future.

In spite of the deteriorating status of the environment, studies of environment have so far not received adequate attention in our academic programme. Recognizing this, the Hon'ble Supreme Court directed the UGC to introduce a basic course on environment at every level in college education. Accordingly, the matter was considered by UGC and it was decided that a six months

compulsory core module course in environmental studies may be prepared and compulsorily implemented in all the University/Colleges of India.

The syllabus of environmental studies includes five modules including human rights. The first two modules are purely environmental studies according to the UGC directions. The second two modules are strictly related with the core subject and fifth module is for human rights.

Objectives

- Environmental Education encourages students to research, investigate how and why things happen, and make their own decisions about complex environmental issues by developing and enhancing critical and creative thinking skills. It helps to foster a new generation of informed consumers, workers, as well as policy or decision makers.
- Environmental Education helps students to understand how their decisions and actions affect the environment, builds knowledge and skills necessary to address complex environmental issues, as well as ways we can take action to keep our environment healthy and sustainable for the future. It encourages character building, and develop positive attitudes and values.
- To develop the sense of awareness among the students about the environment and its various problems and to help the students in realizing the inter-relationship between man and environment and helps to protect the nature and natural resources.
- To help the students in acquiring the basic knowledge about environment and the social norms that provide unity with environmental characteristics and create positive attitude about the environment.

Module I

Unit 1: Multidisciplinary Nature of Environmental Studies

- Definition, Scope and Importance.
- Need for Public Awareness.

(6 Hours)

Unit 2: Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.

- a) **Forest Resources:** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- B) **Water Resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- c) **Mineral Resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d) **Food Resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

- e) **Energy Resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.
- f) **Land Resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
 - Role of individual in conservation of natural resources.
 - Equitable use of resources for sustainable life styles.

(10 Hours)**Unit 3: Ecosystems**

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the given ecosystem:- Forest ecosystem.

(6 Hours)**Module II****Unit 1: Biodiversity and its Conservation**

- Introduction.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.

(4Hours)**Unit 2: Environmental Pollution**

Definition, Causes, effects and control measures of: -

- a. Air pollution.
- b. Water pollution.
- c. Soil pollution.
- d. Marine pollution.
- e. Noise pollution.
- f. Thermal pollution.

- g. Nuclear hazards.
- h. Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- i. Role of an individual in prevention of pollution.
- j. Pollution case studies.
- k. Disaster management: floods, earthquake, cyclone and landslides

(8 Hours)

Unit 3: Social Issues and the Environment

- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people: its problems and concerns, Case studies.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

(10 Hours)

Module III

- I. Meaning of Human Rights; Three Generations of Human Rights.
- II. Ecological approach towards the Human Rights.
- iii. The western and non-western approach towards Human Rights.

(10 Hours)

Module IV

- i. Human rights and Environmental concerns: Environmental movements and right to life/Development Induced Displacement and the right of Tribal population.
- II. Article 21 and Protection of Environment.
- ii. Chipko movement/Appiko movements/Salient valley movements/Narmada Bachavo Andolan/Posco Agitation; Supreme Court and Polluter Pays Principle.

(10 Hours)

Module – V

Unit-1 Human Rights and United Nations – contributions, main human rights related organs- UNESCO, UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights.

Human Rights in India – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities

Unit-2 Environment and Human Rights - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment

Conservation of Natural Resources and Human Rights: Reports, Case studies and policy formulation. Conservation issues of Western Ghats- mention Gadgil committee report, Kasthuriengan report. Over exploitation of ground water resources, marine fisheries, sand mining etc.

(8 Hours)

Internal: Field study

- Visit to a local area to document environmental grassland/ hill /mountain
- Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc
- Study of simple ecosystem-pond, river, hill slopes, etc

(Field work Equal to 5 lecture hours)

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- Centre for Science and Environment, *Down to Earth*.
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- Dc A. K. *Environmental Chemistry*, Wiley Eastern Ltd.
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- R. K. Trivedi and P.K. Goel, *Introduction to air pollution*, Techno-Science Publication (Ref)
- R. Rajagopalan (2016): *Environmental Studies from Crisis and Cure*, Oxford University Press, Published: 2016 (TB)
- R. S. Clark. *Marine Pollution*, Clanderson Press Oxford (Ref)
- R.K. Trivedi, *Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards*, Vol I and II, Enviro Media.
- T.G. Jr Miller, *Environmental Science*, Wadsworth Publishing Co. (TB)
- V.H Heywood & R.T. Watson (1995): *Global Biodiversity Assessment*, Cambridge University Press p.1140.

(M) Magazine (R) Reference (TB) Textbook

Human Rights

- Amartya Sen (2009): *The Idea Justice*, New Delhi: Penguin Books.
- Asia Law House (2001): *Law Relating to Human Rights*.
- K.J.S Chatrath ed., (1998): *Education for Human Rights and Democracy*, Shimla: Indian Institute of Advanced Studies.
- S. K. Khanna (1998): *Children and the Human Rights*, Common Wealth Publishers, 1998.
- Shireesh Pal Singh, *Human Rights Education in 21st Century*, Discovery Publishing House Pvt.Ltd, New Delhi.
- Sudhir Kapoor (2001): *Human Rights in 21st Century*, Mangal Deep Publications, Jaipur.
- United Nations Development Programme (2004): *Human Development Report 2004: Cultural Liberty in Today's Diverse World*, New Delhi: Oxford University Press.

SEMESTER: V
CORE IX: METHODOLOGY OF RESEARCH IN POLITICAL SCIENCE

Course Rationale: The course intends to familiarise the students with basic concepts of the Research Methods in Political Science .It also provides an idea of preparing Research design, various techniques of Data collection, Data analysis and report writing.

MODULE I

Research Methodology

- I. Social Science Research-Meaning and Significance
- II. Scientific knowledge: Induction and Deduction
- III. Types of Research: Pure and Applied, Historical and Analytical, Qualitative and Quantitative, Empirical and Normative.
- IV. Research Ethics.

(25 Hours)

Module II

Building Blocks of Social Research

- I. Research Question-Hypothesis: functions and types; Characteristics of good Hypothesis.
- II. Concepts and variables: A brief analysis.
- III. Research Design- Preparing Research proposal: Selection of Topic- Literature Review- Identification of Research Problem-Adoption of methodology- Operationalisation.

(20 Hours)

Module III:

Data Collection

- i. Source of Data-Primary and Secondary.
- ii. Tools for Collection-Observation, Questionnaire, Interview.
- iii. Survey Research, Using Library, Internet.
- iv. Sampling-Types: Random sampling, Stratified sampling and Systematic sampling.

(20 Hours)

Module IV

Data Processing and Analysis

- i. Editing, Coding, Simple Statistical methods, introduce SPSS.
- ii. Research Report, format of the report, reference-systems and styles, Bibliography- Management Software, citation.
- iii. Academic Plagiarism, Plagiarism Detection Software.

(25 Hours)

References

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- J b Johnson and Joslyn (1989): *Political Science Research Methods*, New Delhi: PHI.
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- Roger Pierce (2008): *Research methods In Politics: A Practical Guide*, Sage, New Deihi
- Zina O Leary (2008): *The Essential Guide to Doing Research*, New Delhi: Vistaar.

B.A. Political Science

Semester –V

Type of Course	Course Code	Name of the Paper
Core	PS05BA901	Elements of International Politics
Core	PS05BAA01	Comparative Political System
Core	PS05BAA02	Research Methods in Political Science
Core	PS05BAA03	Introduction to public Administration
Open Course		

Semester –VI

Type of Course	Course Code	Name of the Paper
Core	PS06BAA02	Society and Politics in Kerala
Core	PS06BAA03	Issues in International Politics
Core	PS06BAA04	Theories and Principles of Public Administration
Core	PS06BAA05	Human rights
Choice-Based	PS06BBA02	India's Foreign Policy
Project	PS06BFA01	Project

MAHATMAGANDHIUNIVERSITY
SYLLUBUS FOR ENGLISH LANGUAGE AND LITERATURE (MODEL1)
2017 ADMISSIONSONWARDS
SCHEME

Semester	Title	Course Category/Code	Hours Per Week	Credits	Internal Assessment	External Exam
1	Fine-tune YourEnglish	Common Course-1 EN1CCT01	5	4	20	80
1	Pearls fromthe Deep	Common Course-2 EN1CCT02	4	3	20	80
1	Second Language	Common Course	4	4	20	80
1	Methodologyof Literary Studies	Core Course-1 EN1CRT01	6	4	20	80
1	History/Political Science/ Sociology/ Psychology	ComplementaryCourse	6	4	20	80
2	Issues that Matter	Common Course-3 EN2CCT03	5	4	20	80
2	Savouring the Classics	Common Course-4 EN2CCT04	4	3	20	80
2	Introducing Language and Literature	Core Course -2 EN2CRT02	6	4	20	80
2	Second Language	Common Course	4	4	20	80
2	History /Political Science / Sociology/ Psychology	ComplementaryCourse	6	4	20	80
3	Literature and/as Identity	Common Course-5 EN3CCT05	5	4	20	80
3	Second Language	Common Course	5	4	20	80
3	Harmonyof Prose	Core Course -3 EN3CRT03	4	4	20	80
3	Symphonyof Verse	Core Course -4 EN3CRT04	5	4	20	80
3	Evolution ofLiterary Movements: the Shapers of Destiny	ComplementaryCourse3 - EN3CMT03	6	4	20	80
4	Illuminations	Common Course-6 EN4CCT06	5	4	20	80
4	Second Language	Common Course	5	4	20	80
4	Modes of Fiction	Core Course -5 EN4CRT05	4	4	20	80
4	Language andLinguistics	Core Course -6 EN4CRT06	5	4	20	80
4	Evolution ofLiterary	ComplementaryCourse4	6	4	20	80

	Movements:the Cross Currents of Change	- EN4CMT04				
5	Open Course	EN5CROP01 Appreciating Films EN5CROP02 TheatreStudies EN5CROP03 English forCareers	4	3	20	80
5	Acts on the Stage	Core Course -7 EN5CRT07	6	5	20	80
5	LiteraryCriticismand Theory	Core Course -8 EN5CRT08	5	4	20	80
5	Indian Writing in English	Core Course -9 EN5CRT09	5	4	20	80
5	Environmental Science and Human Rights	Core Course EN5CRENT0	5	4	20	80
6	Choice Based Course	EN6CBT01Comparativ e Literature EN6CBT02 Modern Malayalam Literaturein Translation EN6CBT03 Regional Literatures in Translation EN6CBT04 Voices from the Margins	4	4	20	80
6	PostcolonialLiteratures	Core Course -10 EN6CRT10	5	4	20	80
6	Women Writing	Core Course -11 EN6CRT11	5	4	20	80
6	AmericanLiterature	Core Course -12 EN6CRT12	5	4	20	80
6	Modern World Literature	Core Course -13 EN6CRT13	5	4	20	80
6	Project	EN6PR01	1	2	20	80

B.A. English Programme – Model - I

Semester –V

Type of Course	Course Code	Name of the Paper
Core	EN05BA901	Reading Drama
Core	EN05BA902	Language and Linguistics
Core	EN05BA903	Literary Criticism: Theory and Practice
Core	EN05BA904	Postcolonial Literature
open course		

Semester –VI

Type of Course	Course Code	Name of the Paper
Core	EN06BA901	Women's Literature
Core	EN06BA902	Indian Writing in English
Core	EN06BA903	Comparative Literature
Core	EN06BA904	American Literature
Project	EN06BF901	Project
Core	EN06BB902	Regional Literature in Translation

B.A. Economics Programme– Model - I
Core, Complementary, Open and Choice-Based
Courses

Sem.	Core Papers	Course Code	Exam	T.H*	Cr.*	Total marks-100	
						Int.*	Ext.*
S1	Perspectives and Methodology of Economics	EC1CRT01	S1	6	4	20	80
	Complementary 1	EC1CMT01	S1	6	4	20	80
S2	Core 2- Micro Economic Analysis 1	EC2CRT02	S2	6	5	20	80
	Complementary 2	EC2CMT02	S2	6	4	20	80
S3	Core 3- Micro Economic Analysis- II	EC3CRT03	S3	4	4	20	80
	Core 4-Economics of Growth & Development	EC3CRT04	S3	5	4	20	80
	Complementary 3	EC3CMT01	S3	6	4	20	80
S4	Core 5-Macro Economics-I	EC4CRT05	S4	5	4	20	80
	Core 6-Public Economics	EC4CRT06	S4	4	4	20	80
	Complementary4	EC4CMT02	S4	6	4	20	80
S5	Core 7-Quantitative Techniques	EC5CRT07	S5	6	4	20	80
	Core 8-Macro Economics-II	EC5CRT08	S5	6	5	20	80
	Open course	EC5OPT01/2/3	S5	4	3	20	80
	Core9-Enviornmental Economics	EC5CRT09	S5	5	4	20	80
	Core10- Introductory Econometrics	EC5CRT10	S5	4	4	20	80
S6	Core 11 –Quantitative Methods	EC6CRT11	S6	6	4	20	80
	Core 12-International Economics	EC6CRT12	S6	5	4	20	80
	Choice based Elective	EC6CBT1/2/3	S6	4	3	20	80
	Core-13 Money & Financial markets	EC6CRT13	S6	5	4	20	80
	Core-14 Indian Economy	EC6CRT14	S6	5	4	20	80
	Project	EC6PR01			2	20	80

Broad Title of Courses *T.H- Teaching Hours per week, Cr.-Credits, Int.-Internal Evaluation and Ext.-External Examination

B.A. Economics Programme – Model - I
Core, Complementary, Choice-based & Open Courses

Sem.	Core Papers	Exam	Teaching hours	Credits	Weightage	
					Internal	External
S1	Core 1 – Methodology of Social Sciences with Special Reference to Economics (EC1B01U)	S1	6	4	1	3
	Complementary 1	S1	6	4	1	3
S2	Core 2 – Development and Environmental Economics (EC2B02U)	S2	6	4	1	3
	Complementary 2	S2	6	4	1	3
S3	Core 3 – Principles of Micro Economics (EC3B03U)	S3	5	4	1	3
	Core 4 – Modern Banking (EC3B04U)	S3	4	4	1	3
	Complementary 3	S3	6	4	1	3
S4	Core 5 – Micro Economic Analysis (EC4B05U)	S4	5	4	1	3
	Core 6 – Public Economics (EC4B06U)	S4	4	4	1	3
	Complementary 4	S4	6	4	1	3
S5	Core 7 – Quantitative Techniques for Economic Analysis (EC5B07U)	S5	6	4	1	3
	Core 8 – Principles of Macro Economics (EC5B08U)	S5	5	4	1	3
	Core 9 – Indian Economy (EC5B09U)	S5	5	4	1	3
	Open Course	S5	4	4	1	3
	Core 10 - Economics of Financial Markets (EC5B10U)	S5	5	4	1	3
S6	Core 11 – Quantitative Economics (EC6B11U)	S6	6	4	1	3
	Core 12 – Macro Economic Analysis (EC6B12U)	S6	5	4	1	3

	Core 13 – Development Issues of the Indian Economy (EC6B13U)	S6	5	4	1	3
	Core 14 – Choice-Based Course	S6	4	4	1	3
	Core 15 – International Economics (EC6B15U)	S6	5	4	1	3
	Project (EC6B16U)	-	-	2	1	3
	Total Credits			82		

Total credits for core and complementary - 78

Open - 4

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B Sc BOTANY PROGRAMME – MODEL I

COMBINATION OF CORE AND COMPLEMENTARY COURSES AND SEMESTER-WISE DISTRIBUTION

Sem.	Course category	Course code	Course title	Instr. hrs.*		Credits
				Th.	Pr.	
I	Core	BO1CRT01	Methodology of Science and an Introduction to Botany	36	36	2 + 1
II	Core	BO2CRT02	Microbiology, Mycology and Plant Pathology	36	36	2 + 1
III	Core	BO3CRT03	Phycology and Bryology	54	36	3 + 1
IV	Core	BO4CRT04	Pteridology, Gymnosperms and Paleobotany	54	36	3 + 1
V	Core	BO5CRT05	Anatomy, Reproductive Botany, Microtechnique	54	36	3 + 1
	Core	BO5CRT06	Research methodology, Biophysics and Biostatistics	54	45	3 + 1
	Core	BO5CRT07	Plant Physiology and Biochemistry	54	45	3 + 1
	Core	BO5CRT08	Environmental sciences and Human Rights	54	36	3 + 1
	Open	BO5OPT01	1. Agri-based microenterprises	72	--	3
	Open	BO5OPT02	2. Horticulture and Nursery management	72	--	3
	Open	BO5OPT03	3. Ecotourism	72	--	3
VI	Core	BO6CRT09	Genetics, Plant Breeding and Horticulture	54	45	3 + 1
	Core	BO6CRT10	Cell and Molecular Biology	54	36	3 + 1
	Core	BO6CRT11	Angiosperm morphology, Taxonomy and Economic Botany	72	45	3 + 1
	Core	BO6CRT12	Biotechnology and Bioinformatics	54	36	3 + 1
	Elective	BO6PET01	1. Agribusiness	54	--	3
	Elective	BO6PET02	2. Plant Genetic Resources Management	54	--	3
	Elective	BO6PET03	3. Phytochemistry and Pharmacognosy	54	--	3
	Project	BO6PRT01	Investigatory project work done individually or in groups	--	--	2
I	Compl. 1	BO1CMT01	Cryptogams, Gymnosperms and Plant Pathology	36	36	2 + 1
II	Compl. 2	BO2CMT02	Plant Physiology	36	36	2 + 1
III	Compl. 3	BO3CMT03	Angiosperm Taxonomy and Economic Botany	54	36	3 + 1
IV	Compl. 4	BO4CMT04	Anatomy and Applied Botany	54	36	3 + 1

* 18 instructional hours is equal to one teaching hour per week

SEMESTER I

Core course 1 Code: BO1CRT01
METHODOLOGY OF SCIENCE AND AN INTRODUCTION TO BOTANY
(Theory 36 hrs; Practical 36 hrs; Credits 2 + 1)

Objectives:

- Understand the universal nature of science
- Demonstrate the use of scientific method
- To lay a strong foundation to the study in Botany
- Impart an insight into the different types of classifications in the living kingdom.
- Appreciate the world of organisms and its course of evolution and diversity.
- Develop basic skills to study Botany in detail.

Module 1: Introduction to science and the methodology of science (4 hrs)

Scientific method: steps involved - observation and thoughts, formulation of hypothesis; inductive reasoning - testing of hypothesis; deductive reasoning - experimentation - formulation of theories and laws.

Module 2: Experimentation in science (4 hrs)

Selection of a problem - searching the literature – designing of experiments - selection of variables, study area, and a suitable design. Need of control, treatments and replication. Mendel's experiments as an example of moving from observations to questions, then to hypothesis and finally to experimentation. Ethics in science.

Module 3: Origin and evolution of life (10 hrs)

Origin of life on earth from molecules to life - Oparin's hypothesis, Haldane's hypothesis, Miller-Urey experiment, Panspermia, origin of cells and the first organisms. Evolutionary history of Biological diversity – fossil record; geological time scale – major events in each era. Evidences of evolution; theories of evolution - Lamarck, Wallace, Charles Darwin, Hugo De Vries. Neo-Darwinism – major postulates - isolation, mutation, genetic drift, speciation.

Module 4: Diversity of life and its classification (12 hrs)

Diversity of life: two kingdom classification (Carolus Linnaeus, 1735); phylogenetic classification (August W Eichler, 1878); five kingdom classification (R H Whittaker, 1969). Three domains, six kingdom classification, (Carl Woese, 1990) – criteria for classification, general characters of each kingdom. The three domains of life: Archaea, Bacteria, Eucarya – general characters of each.

Diversity of plants: study the salient features of algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms.

Module 5: Basic Botanical skills (6 hrs)

Light microscope: dissection and compound microscope – parts and uses. Preparation of specimens for light microscopy - collection and preservation of plant specimens; killing and fixing; killing agents - formalin, ethyl alcohol; fixing agents - Carnoy's fluid, Farmer's fluid, FAA; herbarium (brief study only). Whole mounts and sections – hand sectioning – TS, TLS, RLS. Staining plant tissues: purpose; stains - safranin, acetocarmine, crystal violet. Temporary and permanent mounting, mountants.

PRACTICAL (36 hrs)

1. Design an experiment to verify a given hypothesis.
2. Conduct a survey-based inquiry on a given topic (To test the validity of a given hypothesis. E.g., all angiosperm parasites are Dicot plants).
3. Select an important classical experiment and find out the different elements of the methodology of science (e.g., Robert Koch experiment).
4. Conduct field surveys to identify and collect plant specimens to appreciate the diversity of plant kingdom. Submit five preserved specimens (in bottles and/or herbarium) belonging to diverse groups.
5. Identification of plants with vascular elements, plants which produce flowers, fruits, seeds, cone, sporophyll, embryos and study their salient features.
6. Prepare temporary, stained hand sections (TS, TLS, RLS) of plant specimens appropriate for light microscopic studies.

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8. Paul B Weisz. The Science of Biology. McGraw Hill.
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SEMESTER III

Core course 3 Code: BO3CRT03
PHYCOLOGY AND BRYOLOGY
(Theory 54 hrs; Practical 36 hrs; Credits 3 + 1)

Objectives:

- To study the evolutionary importance of Algae as progenitors of land plants
- Understand the unique and general features Algae and Bryophytes and familiarize it
- To study the external morphology, internal structure and reproduction of different types of Algae and Bryophytes
- Realize the application of Phycology in different fields

PHYCOLOGY (Theory 36 hrs; Practical 27 hrs)

Module 1: Introduction to Phycology and classification of Algae (9 hrs)

Introduction: general characters, habitat diversity, range of thallus structure and pigments in algae; structure of algal flagella. Different types of life cycle and alternation of generations in algae. Classification: by Fritsch (1945); brief introduction to the modern classification by Lee (2009) [up to divisions].

Module 2: Type study (18 hrs)

Salient features, thallus structure and reproduction of algae in the following groups with special reference to the type(s) mentioned: Cyanophyceae - *Nostoc*; Chlorophyceae - *Volvox*, *Oedogonium*, *Cladophora*, *Chara*; Xanthophyceae – *Vaucheria*; Bacillariophyceae - *Pinnularia*; Phaeophyceae – *Ectocarpus*, *Sargassum*; Rhodophyceae - *Polysiphonia*.

Module 3: Artificial culture and economic importance of Algae (9 hrs)

Algal culture: isolation, cultivation and preservation of micro- and macro-algae. Economic importance of algae: algae as food, SCP, fodder, green manure, role in N₂ fixation, medicine and biofuels. Commercial products from Algae - carrageenin, agar-agar, alginates and diatomaceous earth. Role of algae in pollution studies: as indicators of pollution and as bioremediation agents. Eutrophication – algal bloom; harmful and toxic algal blooms – neurotoxins and parasitic algae.

PRACTICAL (27 hrs)

1. Conduct a field visit to any one of the ecosystems rich in Algae to experience algal diversity. Submit a report with photographs.
2. Make micropreparations of vegetative and reproductive structures of the types mentioned in the syllabus.
3. Algal Culture: isolation and cultivation of micro- and macro-algae in suitable growth media (Demonstration only).
4. Familiarizing the technique of algal collection preservation.

BRYOLOGY (Theory 18 hrs; Practical 9 hrs)

Module 4: General introduction and classification of bryophytes (4 hrs)

Introduction, general characters and classification of bryophytes by Rothmaler (1951); a very brief account of systems and classifications by Goffinet *et al* (2008).

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21. Singh B D, 1996. Biotechnology. Kalyani Publishers.

Open course 2 **Code: BO5OPT02**
HORTICULTURE AND NURSERY MANAGEMENT
(Theory 72 hrs; Credits 3)

Objectives:

- Understand the importance of horticulture in human welfare.
- Understand the propagation and cultural practices of useful vegetable, fruit and garden plants.
- Understand the impact of modern technologies in biology on horticultural plants.
- Understand the basic concepts of landscaping and garden designing.
- Inculcate interest in landscaping, gardening and flower and fruit culture.

HORTICULTURE (48 hrs)

Module 1: Introduction (10 hrs)

Introduction to horticulture: definition, history; classification of horticultural plants, disciplines of horticulture. Soil: formation, composition, types, texture, pH and conductivity. Garden tools and implements.

Preparation of nursery bed; manures and fertilizers - farm yard manure, compost, vermicompost, biofertilizers; chemical fertilizers - NPK; time and application of manures and fertilizers, foliar spray. Irrigation methods - surface, sub, drip and spray irrigations - advantages and disadvantages - periodicity of irrigation.

Module 2: Propagation of plants (10 hrs)

Propagation of horticultural plants - by seeds; seed development and viability, seed dormancy, seed health, seed testing and certification. Growing seedlings in indoor containers and field nurseries, seed bed preparation, seedling transplanting; advantages and disadvantages of seed propagation.

Vegetative propagation - organs used in propagation - natural and artificial vegetative propagation; methods - cutting, layering, grafting and budding; advantages and disadvantages of vegetative propagation; micropropagation.

Module 3: Gardening (10 hrs)

Gardening - ornamental gardens, indoor gardens, kitchen gardens- terrestrial and aquatic gardens - garden adornments; garden designing; garden components - lawns, shrubs and trees, borders, hedges, edges, drives, walks, topiary, trophy, rockery; famous gardens of India. Landscape architecture - home landscape design, urban planning, parks, landscaping and public buildings, industrial and

highway landscaping. Physical control of plant growth - training and pruning - selection of plant, bonsai containers and method of bonsai formation.

Module 4: Floriculture (6 hrs)

Introduction, commercial floriculture - jasmine, orchid, anthurium, rose, gladiolus; production of cut flowers, quality maintenance, packing, marketing. Flower arrangements - basic styles - upright and slanting - japanese Ikebana, dry flower arrangement.

Module 5: Olericulture (4 hrs)

Olericulture - types of vegetable growing - home gardens and market gardens; cultivation practices of leafy vegetable (Amaranthus), tuber (Potato), fruit (Tomato), flower (Cauliflower).

Module 6: Pomology (4 hrs)

Pomology - cultivation of fruit crops - mango, banana and pine apple - preparation of land, spacing, planting, irrigation, hormones, harvest and storage. Factors affecting duration of storage. Principles of preservation - temporary and permanent - agents for fruit preservation. Preparation of pickles, jams, jellies and squashes using locally available fruits.

Module 7: Gardening – additional features (4 hrs)

Garden friends - honey bees, ladybirds, frogs, spiders, earthworms, centipedes and millipedes. Garden foes - pests, pathogenic fungi, bacteria, virus. Control measures - pesticides and fungicides; neem tobacco decoction. Hazards of chemical pesticides; equipments used in controlling horticultural pests - sprayers, dusting equipments - sterilization, fumigation.

Weeds - annual, perennial; weed control - prevention, eradication - hand weeding, tillage, burning, mowing, biological control, use of herbicides - selective and non selective - mechanisms involved in herbicidal actions.

NURSERY MANAGEMENT (6 hrs)**Module 1: Nurseries (6 hrs)**

Nursery: definition, types; management strategies - planning, layout, budgeting - production unit, sales unit. Plant growing structures - green houses, fernery, orchidarium, arboretum.

ON HAND TRAINING (18 hrs)

1. Preparation of potting mixture of known combination and potting in earthen pots/poly bags.
2. Preparation of nursery beds.
3. Preparation of compost/vermicompost using different substrates.
4. Working knowledge and identification of garden tools and implements.
5. Practical knowledge in different plant propagation techniques listed in syllabus.
6. Cultivation of a vegetable/ornamental plant/fruit crop listed in the syllabus.
7. Practice of different pruning operations (top dressing, shaping and topiary) in the following plants: (1) Bougainvillea (2) Phyllanthus.
8. Visit a well established nursery and submit report.

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stakeholders, linkages, economics, ecotourism auditing. Problems with ecotourism. Carrying capacity of ecotourism. ecotourism facilities – Green report card. Ecotourism management – issues.

Module 8: Ecotourism and livelihood security (4 hrs)

Community, biodiversity conservation and development – Eco-development committees.

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5. Croall J, 1995. *Preserve or Destroy: Tourism and Environemnt*. Calouste Gulbenkian Foundation, London.

SEMESTER VI

Core course 9 **Code: BO6CRT09**
GENETICS, PLANT BREEDING AND HORTICULTURE
(Theory 54 hrs; Practical 45 hrs; Credits 3 + 1)

Objectives:

- Imparting an insight into the principles of heredity
- Understand the patterns of inheritance in different organisms
- Understand the inheritance pattern of nuclear and extra nuclear genes
- Understand the methods of crop improvement
- Understand the importance of horticulture in human welfare
- Develop skill in gardening technique among students

GENETICS (Theory 27 hrs; Practical 27 hrs)

Module 1: Origin and development of Genetics (3 hrs)

Genetics as a science: origin - experiments of Mendel with *Pisum sativum*, general terminology used in genetics. Principles of inheritance, Mendelian laws - monohybrid and dihybrid cross, test cross and backcross.

Module 2: Exceptions to Mendelism (10 hrs)

Modification of Mendelian ratios: incomplete dominance - *Mirabilis*; Co-dominance - MN blood group in man; Lethal genes – pigmentation in Snapdragon..

Geneic interaction: epistasis, (a) Dominant - fruit colour in summer squashes (b) Recessive - coat colour in mice; Complementary genes - flower colour in sweet pea. Non-epistasis - comb pattern in Fowls. Multiple alleles – ABO blood groups in man; self sterility in *Nicotiana*.

Module 3: Linkage of genes (3 hrs)

Linkage and crossing over: chromosome theory of linkage; crossing over - types of crossing over, mechanism of crossing over. Linkage map - 2 point cross, interference and coincidence.

Module 4: Determination of sex (6 hrs)

Sex determination: sex chromosomes and autosomes; chromosomal basis of sex determination; XX-XY, XX-XO mechanism; sex determination in higher plants (*Melandrium album*). Sex linked

inheritance: X-linked - Morgan's experiment e.g. eye colour in *Drosophila*, Haemophilia in man; Y-linked inheritance; sex limited and sex influenced inheritance. Pedigree analysis.

Module 5: Quantitative inheritance (2 hrs)

Quantitative characters: polygenic inheritance, continuous variation - kernel color in wheat, ear size in maize.

Module 6: Extra-chromosomal inheritance (2 hrs)

Extra chromosomal inheritance: chloroplast mutation - variegation in 4O'clock plant; mitochondrial mutations in yeast. Maternal effects - shell coiling in snail; infective heredity - kappa particles in *Paramecium*.

Module 7: Population genetics (1 hr)

Concept of population, gene pool, Hardy-Weinberg principle (brief).

PRACTICAL (18 hrs)

1. Students are expected to work out at least two problems each from: monohybrid, dihybrid, back-cross and test cross; all types of modified Mendelian ratios mentioned in the syllabus.

PLANT BREEDING (Theory 13 hrs; Practical 9 hrs)

Module 1: Introduction to plant breeding (1 hr)

Introduction and objectives of plant breeding. Plant breeding centers in Kerala, their achievements – CPCRI, CTCRI, RRII.

Module 2: Plant introduction (2 hrs)

Plant introduction: domestication - centers of origin - procedure of plant introduction - quarantine regulations, acclimatization, agencies of plant introduction in India, major achievements.

Module 3: Selection (2 hrs)

Plant Selection: mass, pure-line, clonal.

Module 4: Hybridization (4 hrs)

Hybridization: types, procedure, important achievements. Heterosis in plant breeding, inbreeding depression, genetics of heterosis and inbreeding depression. Handling segregating generation - pedigree method, bulk method, back cross method. Disease resistance breeding.

Module 5: Mutation breeding and polyploidy breeding (2 hrs)

Mutation breeding: methods, applications and important achievements. Polyploidy breeding: methods and applications.

Module 6: Tissue culture as method in plant breeding (2 hrs)

Application of meristem culture, embryo culture and pollen culture in plant breeding. Role of tissue culture in the creation of transgenic plants.

PRACTICAL (9 hrs)

1. Emasculation and bagging.
2. Demonstration of hybridization in plants.
3. Estimation of pollen sterility/viability.

HORTICULTURE (Theory 14 hrs; Practical 18 hrs)

Module 1: Introduction (3 hrs)

Introduction to horticulture - definition, history. Classification of horticultural plants. Disciplines of horticulture - pomiculture, olericulture, floriculture, arboriculture.

Garden implements - budding knife, secateurs, hedge shear, hand cultivator, sprayers, lawn mower, garden rake, spade.

Irrigation methods: surface, sub, drip and spray irrigations; mist chambers - advantages and disadvantages.

Module 2: Plant propagation: (5 hrs)

Seed propagation: seed testing and certification, seed bed preparation, seedling transplanting, hardening of seedling; advantages and disadvantages of seed propagation. Vegetative propagation: natural and artificial; artificial methods - cutting, layering, grafting and budding, micro-propagation; advantages and disadvantages of vegetative propagation.

Module 3: Gardening (6 hrs)

Types of garden: brief study on ornamental garden, indoor garden, kitchen garden, aquatic garden, vertical garden, medicinal garden, terrace garden, terrarium.

Garden designing: garden components - lawns, shrubs and trees, borders, topiary, hedges, edges, walks, drives.

Physical control of plant growth: training and pruning. Bonsai - selection of plant - bonsai containers and method of bonsai formation.

Plant growing structures: green house, orchidarium, conservatory; Potting mixture – components.

PRACTICAL (18 hrs)

1. Approach grafting (demonstration only), budding (T, patch), air layering.
2. Identification of different garden tools and their uses.
3. List out the garden components in the photograph of the garden given.
4. Visit to established horticultural/agricultural/ornamental/kitchen gardens and observe the components there.

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Core course 11 **Code: BO6CRT11**
ANGIOSPERM MORPHOLOGY, TAXONOMY AND ECONOMIC BOTANY
(Theory 72 hrs; Practical 45 hrs; Credits 3 + 1)

Objectives:

- Acquaint with the aims, objectives and significance of taxonomy.
- Identify the common species of plants growing in Kerala and their systematic position.
- Develop inductive and deductive reasoning ability.
- Acquaint with the basic technique in the preparation of herbarium.
- Familiarizing with the plants having immense economic importance.

ANGIOSPERM MORPHOLOGY

Module 1: Leaf, Inflorescence and Fruit morphology (13 hrs)

Leaf Morphology: types, venation, phyllotaxy. Morphology of flower: flower as modified shoot; detailed structure of flowers - floral parts - their arrangement, relative position - symmetry, aestivation and placentation types - cohesion and adhesion. Floral diagram and floral formula. Inflorescence: racemose types - simple raceme, corymb, umbel, spike, spadix, head and catkin; cymose types - simple cyme; monochasial - scorpid and helicoid, dichasial and polychasial; special type - cyathium, hypanthodium, verticillaster, thyrus and panicle. Fruits: simple - fleshy, dry - dehiscent, schizocarpic, indehiscent, aggregate, multiple (sorsis and syconus).

TAXONOMY

Module 2: Principles of Plant systematics (12 hrs)

Aim, scope, significance and components of taxonomy. Types of classification - artificial (brief account), natural – Bentham and Hooker (Detailed account) and Phylogenetic (Brief account). Angiosperm phylogeny group system (introduction only). Plant nomenclature - binomial, ICBN/ICN principles - rule of priority and author citation. Interdisciplinary approach in taxonomy -

Cytotaxonomy and Chemotaxonomy. Herbarium technique – importance of herbarium; preparation of herbarium and their preservation. Important herbaria in India, BSI.

Module 3: Detailed study of families (30 hrs)

Study the following families of Bentham and Hooker's System with special reference to their vegetative and floral characters; special attention should be given to common and economically important plants within the families: Annonaceae, Nymphaeaceae, Malvaceae, Rutaceae, Anacardiaceae, Leguminosae (Mimosaceae, Caesalpiniaceae and Fabaceae), Combretaceae, Myrtaceae, Cucurbitaceae, Umbelliferae (Apiaceae), Rubiaceae, Compositae (Asteraceae), Sapotaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Convolvulaceae, Scrophulariaceae, Acanthaceae, Verbenaceae, Labiatae (Lamiaceae), Amaranthaceae, Euphorbiaceae, Orchidaceae, Palmae (Arecaceae), Graminae (Poaceae).

ECONOMIC BOTANY AND ETHNOBOTANY (Theory 9 hrs; Practical 9 hrs)

Module 4: Economic botany (12 hrs)

Study the following groups of plants with special reference to the botanical name, family and morphology of the useful part and uses: Cereals - Rice, Wheat; Millets Ragi; Pulses - Green gram, Bengal gram, Black gram; Sugar yielding plants – Sugarcane; Fruits - Apple, Pineapple, Orange, Mango and Banana; Vegetables - Bittergourd, Ladies finger, Carrot and Cabbage; Tuber crops - Tapioca; Beverages - Tea, Coffee; Oil yielding plants - Ground nut, Coconut, Gingelly; Spices – Cardamom, Pepper, Cloves, Ginger; Timber yielding plants - Teak wood and Rose wood; Fibre yielding plants - Coir, Jute, Cotton; Rubber yielding plants - Para rubber; Gums and Resins - White damer, Gum Arabic, Asafoetida; Insecticide yielding Plants - Tobacco and Neem.

Module 5: Ethnobotany (5 hrs)

Introduction, scope and significance of ethnobotany. Study of the following plants used in daily life by tribals and village folks for food, shelter and medicine: Food - *Artocarpus heterophylla*, *Corypha*; Shelter - *Bambusa*, *Ochlandra* and *Calamus*; Medicine – *Curcuma longa*, *Trichopus zeylanicus* and *Alpinia galanga*.

PRACTICAL (45 hrs)

1. Identify the following inflorescence and fruits with reference to their morphological specialities: (a) Inflorescence - simple raceme, spike, corymb, head, simple cyme, cyathium and hypanthodium. (b) Fruits - simple - (fleshy) - berry drupe, pepo, hesperidium. Dry indehiscent - nut. Dry dehiscent - legume, capsule (loculicidal). Aggregate.
2. Preparation of floral formula and floral diagram from floral description (of families studied).
3. Identify the families mentioned in the syllabus by noting their vegetative and floral characters.
4. Students must describe the floral parts, draw the L.S., floral diagram and write the floral formula of at least one flower from each family.
5. Prepare herbarium of 25 plants with field notes.
6. Conduct field work for a period of not less than 5 days under the guidance of a teacher and submit field report.
7. Study the finished products of plants mentioned in the syllabus of economic botany with special reference to the morphology of the useful part, botanical name and family.
8. Identify and describe the ethnobotanical uses of the items mentioned in the syllabus.

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MAHATMA GANDHI UNIVERSITY
PRIYADARSHINI HILLS, KOTTAYAM – 686 560

**CHOICE BASED COURSE CREDIT
SEMESTER SYSTEM AND GRADING**

SCHEME & SYLLABI

For
Under Graduate Course

IN
BOTANY

B. Sc Botany Programme

- 1. Model I*
- 2. Model II (Vocational) &*
- 3. Model III (Double core)*

BOARD OF STUDIES IN BOTANY (U G)
2009

B. Sc. Programme in Botany (Core courses):

The following table shows the structure of the programme which indicate Code of the courses, Title of the courses, Instructional hours Credits, University Examination time and the components for internal and external evaluation

Semester	CODE	NAME OF CORE COURSE	INST.HRS/ WEEK	CREDIT	Tot. CREDITS	Total Hours/sem	University exam	Weightage	
								IA	EA
1	BO1B01U	Methodology and Perspectives of Science & Introduction to the World of Plant Diversity	2	2	3	72	3hrs	1	3
		PRACTICAL 1 (Internal)	2	1					
2	BO2B02U	General Informatics and Methodologies in Plant Sciences	2	2	3	72	3	1	3
		PRACTICAL 2 (External)	2	1					
3	BO3B03U	Microbiology and Phycology	3	3	4	90	3	1	3
		PRACTICAL 3(Internal)	2	1					
4	BO4B04U	Anatomy & Reproductive Botany of Angiosperms	3	3	4	90	3	1	3
		PRACTICAL 4 (External)	2	1					
5	BO5B05U	Mycology, Lichenology and Pathology	2	2	4	108	3	1	3
		PRACTICAL 5(Internal)	4	2					
	BO5B06U	Environmental Science and Ecotourism	3	3	4	90	3	1	3
		PRACTICAL 6(Internal)	2	1					
	BO5B07U	Genetics, Plant Breeding and Horticulture	3	3	4	90	3	1	3
PRACTICAL 7 (Internal)		2	1						
BO5B08U	Cell and Molecular Biology and Evolution	3	3	4	90	3	1	3	
	PRACTICAL 8 (Internal)	2	1						
BO5D01U	OPEN COUESE: Horticulture and Nursery Management/ Ecotourism/ Agribased Microenterprises / Biotechnology/Bioinformatics	4	4	4	72	3	1	3	
	BO6B09U	Plant Physiology and Biochemistry	3	2	4	126	3	1	3
		PRACTICAL 9 (External)	4	2					

6	BO6B10U	Bryology, Pteridology, Gymnosperms and Palaeobotany PRACTICAL 10 (External)	3 2	3 1	4	90	3	1	3
	BO6B11U	Angiosperm Morphology, Taxonomy and Eco. Botany PRACTICAL 11 (External)	3 2	3 1	4	90	3	1	3
	BO6B12 U	Biotechnology and Bioinformatics PRACTICAL 12 (External)	3 2	3 1	4	90	3		3
	BO6B13 U	CORE- CHOICE BASED COURSE :- <i>Plant Genetic Resource / Phytochemistry / Agribusiness</i>	3	3	3	54	3	1	3
	BO6B14U	Project & Viva		1	1			1	3

Mahatma Gandhi University

B.Sc Botany Programme

SEMESTER I

Course 1

BO1B01U

Methodology and Perspectives of Science

&

An Introduction to the World of Plant Diversity

(Theory 36 hours, Practical 36 hours)

(Theory Credit 2, Practical credit 1)

Methodology and Perspectives of Science (Theory 18hours, Practical 18 hours)

Module 1.

8 hours

Introduction to science and scientific methods

-Introduction to science

-Steps in scientific methods

- observation and thoughts

- formulation of a hypothesis

- designing of experiments

- testing of hypothesis

- formulation of theories

- Revision of scientific theories with the advent of new technologies

Module 2.

10 hours

Experimentation in science

- Selection of a problem
- Searching the literature
- Selection of variables, study area, and a suitable design
- Necessity of units and dimensions
 - Units of length, volume, area, concentration, temperature, pressure
- Setting of hypothesis, Null- hypothesis and alternative hypothesis
- Need of control, treatments and replication
- Analysis, presentation and interpretation of data
- Testing of hypothesis, need of statistical tools (study of specific tools is not required)
- Examples of great experiments in life sciences
 - An example of moving from a question to hypothesis and then to an experimental design
 - Contributions and the great experiments of Louis Pasteur, and Robert Koch
- Ethics in science

Practical

18 hours

1. Design and perform a simple experiment to familiarize with the methodology of science
2. Select an important classical experiment and find out the different elements of scientific method
3. Prepare a biographical sketch of great scientists with special emphasis on the scientific methodology involved in their experiments
4. Prepare $\text{CuSO}_4 \cdot \text{H}_2\text{O}$ solution of different molarity using a stock solution
5. Determination of the area of different types of leaves using graph paper

An Introduction to the World of Plant Diversity (Theory 18 hours, Practical 18 hours)

Module 1

3 hours

- Plants, their uniqueness and importance as
 - Primary producers
 - Source of oxygen
 - Source of materials for food and shelter
 - Medicines and other compounds derived from plants
 - Source of fuel (fossil fuel, biofuel)
 - Recreational value

(a brief account with examples alone is required)

Module 2.

3 hours

Unity of living organisms

Unity in,

- Cellular organization
- Cell structure
- Metabolism
- Genetics
- Cell division
- Sexual reproduction (Only a preliminary study about the unity of different live forms in the above mentioned aspects alone is required)

Module 3.

12 hours

1. Diversity of living organisms [No type study is expected]

- **Prokaryotes**
 - Bacteria – general characteristics, variation in form (bacillus, coccus, vibrio, spirillum)
 - Cyanobacteria / BGA (No type study is intended) – general characteristics, pigments in Cyanobacteria, variation in form
- **Eukaryotes**
 - Eichler's Classification
 - **Cryptogams**
 - Algae:-
 - General characteristics
 - Diversity in thallus morphology (Unicellular, colonial, unbranched filamentous, branched filamentous)
 - Diversity in pigments (Pigments characteristic of Chlorophyceae, Rhodophyceae and Phaeophyceae)
 - Fungi
 - General characteristics
 - Diversity in thallus morphology (unicellular forms, aseptate and septate hyphal forms)
 - Lichens
 - General characteristics

- Diversity in thallus morphology (crustose, foliose and fruticose forms)
- Bryophytes

- General characteristics
- Diversity in thallus morphology
- Alternation of generation, prominence of gametophyte
- Concept of embryo

-Pteridophytes

- General characteristics
- Diversity in morphology
- Concept of vasculature (study of different types of steles is not required)
- Alternation of generation, prominence of sporophyte

-Phanerogams

-Gymnosperms

- General characteristics
- Diversity in morphology
- As the first plant group exhibiting seed habit, advantages of seed
- Special structures which contributed to the development of seed (ovule, integuments of ovule, endosperm)

-Angiosperms

- General characteristics
- Diversity in morphology (dicots, monocots, herbs, shrubs, trees, climbers, twiners, branched, unbranched)
- Concept of fruit, advantages of fruit
- Special structures which contributed to the development of fruit (ovary, placenta)

-Animals

- Major differences between plants and animals
(Detailed study of different classes not required)

- **Habitat Diversity** (Brief study only)

- Aquatic:- Fresh water, marine, mangrove
- Terrestrial:- Evergreen forest, deciduous forest, grass land
- Epiphytic

- **Evolutionary trends in the plant world** (shift in habitat from aquatic to terrestrial, shift in prominence of gametophyte to sporophyte, shift from thalloid forms to differentiated forms, evolution of conducting tissue; tracheids to vessels, origin of seed and fruit)
- Interactions in the plant world. Examples of,
 - Plant – plant interactions (Brief account of Parasitic plants and epiphytes)
 - Plant – microbe interactions (Brief account of root nodules and Micorrhiza)
 - Plant – animal interactions (Brief account of Leaf and stem galls and mermicophylly)

Practical

18 hours

1. Collect, identify, record and submit 3 genera each from algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms. Use appropriate preservation techniques.
2. Study and submit a report on any one of the interactions observed in the plant world
3. Conduct a field visit to any one of the ecosystems/ botanic gardens to experience the plant diversity. Submit a report with photographs.
4. From a lot of given materials identify a particular plant group
5. From a lot of given materials identify plants with vascular elements, plants which can produce seeds, fruits, embryos

References

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MAHATMA GANDHI UNIVERSITY
B.Sc. BOTANY PROGRAMME
Semester V Course 6 B05B06U
ENVIRONMENTAL SCIENCE AND ECOTOURISM
(Theory :54 hours; Practical : 45hours) (Theory Credit 3, Practical Credit1)

Course Objectives:

1. Acquaint the student with the significance of Environmental Science.
2. Help the students to understand the extent, limitations and depletion of natural resources
3. Help the student to design novel mechanism for the sustainable utilization of natural resources.
4. Enable the students to understand the structure and function of the Ecosystems
5. Make the students to identify the nature and interactions of populations in the ecosystem
6. Enable the students to understand various kinds of pollution in the environment, their impacts on the ecosystem and their control measures
7. Make the students aware about the nature and structure of various environmental laws in India

8. Make the students aware about the role of various movements in the protection of nature and natural resources.
9. Make the students aware about the extent of the total biodiversity and their conservation.
10. Make the students to assess the positive and negative impacts of Ecotourism and its role in the sustainable utilization of resources for tourism.

ENVIRONMENTAL SCIENCE

48 hours

Module 1

1 hour

Environmental science and its multidisciplinary nature

Introduction, relevance and scope, public awareness

Module 2

6 hours

Natural Resources

- Types of resources-renewable and non renewable
- Forest resources: Timber extraction, mining, dams, over exploitation, deforestation, MFP (minor Forest products) , Joint Forest Management (JFM)
- Water resources: surface and ground water, drinking water, dams-benefits and problems, conflict over water, Rain water harvesting, Water shed conversation
- Food resources: major food crops in India. Causes of food shortage. Food security, world food problems.
- Energy resources: Energy plantation, - *Jatropha*
- Land resources: Land use, land degradation, desertification, EFL(Ecologically Fragile Land)
- Conservation of Biodiversity , ecological footprints

Module 3

10 hours

Ecosystems:

- Structure and function of ecosystem: Ecosystem components- abiotic and biotic, Productivity – primary and secondary-gross and net productivity. Decomposition in nature, homeostasis in ecosystem
- Ecological energetics: energy flow, trophic levels, food chain and food web, ecological pyramids
- Nutrient cycles: Biogeochemical cycles of C, N and S.

Module 4

4 hours

Community ecology

- Population: size, density, natality, mortality.
- Community characteristics: Species diversity and species richness, dominance, growth forms and structure, trophic structure.
- Association of communities: plant association, ecotypes, ecotone, edge effect, ecological indicators.
- Ecological succession: types of succession, process – migration, ecesis, colonization, stabilization and climax community; hydrosere, xerosere, lithosere.

Module 5

4 hours

Plants and environment

Ecological complexes and factors affecting plants growth and response:

- Climatic factors: temperature and pressure; water - precipitation, humidity, soil water holding capacity; light - global radiation.
- Topographic factors: altitude and aspects
- Edaphic factors - profile and physical and chemical properties of soil
- Biotic factors: interactions – positive and negative.

Species – ecosystem interaction: Habitat, ecological niche, microclimate

Adaptation of plants to environment: To Water- Xerophytes, Hydrophytes; Temperature – thermo periodicity, vernalization; light – photoperiodism, heliophytes, sciophytes; salinity – halophytes, mangroves.

Module 6

Environmental pollution and Management

12 hours

- Definition and general introduction
- Air pollution: Causes and sources, types of pollutants-particulates-aerosol, mist, dust, smoke, fume, plume, fog, smog. Effect of air pollution on plants and animals, Bhopal Gas Tragedy.
- Water pollution: Sources and types of pollutants. Water quality standards, water quality assessment. Ground water pollution-blue baby syndrome. Cycling of heavy metals, hydrocarbons. Eutrophication, BOD, Minamata disease.
- Soil pollution: Causes and sources-waste dumps, municipal wastes, agrochemicals, mining, solid waste management-vermi composting.
- Noise pollution: Sources, standards and measurements, effect on health, control techniques.
- Thermal pollution: Sources and effects
- Nuclear hazards: Sources and impacts.
- EIA: Environmental Impact Assessment in polluted areas

Module 7

Social issues and the environment:

2 hours

Climate change, global warming and green house gases, IPCC, Acid rain, Ozone layer depletion, nuclear accidents and nuclear holocaust.

Module 8

Environmental legislation and laws:

1 hour

(1) Environment (protection) Act, 1986, (2) Air (Prevention and control of pollution) Act, 1981, (3) Water (Prevention and control of pollution) Act, 1974, (4) Wildlife (protection) Act, 1972, (5) Forest (Conservation) Act, 1980 (briefly).

Module 9

6 hours

Biodiversity and Conservation biology:

- Endemism: Definition-types-factors. Hotspot of endemism-hotspots in India. IUCN-threat categories. Red data book., Western Ghats as the hottest spot and its conservations.
- Biodiversity loss: Causes and rate of biodiversity loss, extinction-causes. Alien species, negative and positive impacts
- Conservation efforts: Rio Earth Summit, Agenda 21, Kyoto protocol, COP 15(15th Conference of the Parties under the U N Framework Convention on Climate Change), IPCC (Inter Governmental Panel for Climate Change) and its contribution. Conservation strategies and efforts in India and Kerala, In situ and ex situ conservation methods. Role of NGOs in biological conservation

Module 10

2 hours

Organizations, movements and contributors of Ecological studies

- *Organizations:* BNHS, WWF, CSE, NEERI, , MoEF, Green Peace, Chipko
- *Famous contributors of Ecology in India:* Salim Ali, M.S. Swaminathan, Madhav Gadgil, M.C. Mehta, Anil Agarwal, Medha patkar, John C. Jacob, Sunderlal Bahuguna

ECOTOURISM:

6 hours

Definition, concept, introduction, history, relevance and scope. Components of ecotourism: Forms and types of ecotourism in India and Kerala, ecotourism resources- biological, historical, cultural, and geographical. Ecotourism centers in Kerala. Positive and negative impacts of ecotourism.

Practicals –

45 hours

1. Estimation of CO₂, Cl, and salinity of water samples (Titremetry)
2. Determination of pH of soil and water
3. Assessment of diversity, abundance, and frequency of plant species by quadrat method (Grasslands, forests)
4. Study of the most probable number (MPN) of coliform bacteria in water samples

5. EIA studies in degraded areas (Sampling – line transect, Quadrate)
6. Visit to any forests types including grasslands and preparation of the list of Rare and threatened (R&T) plants (no collection of specimens)
7. Collection, identification and preparation of the list of exotic species in the locality.
8. Identification of pollutant to respective pollution types.
9. Study of anatomical, morphological, physiological adaptation of plants to the environment (Xerophytic, Hydrophytic, Epiphytic, Halophytic).
10. Collection and recording of rain data by using simple rain gauge.

Open course 2
Code: BO5D01U

HORTICULTURE AND NURSERY MANAGEMENT
(Theory 72 hrs; Credits 3)

Objectives:

- Understand the importance of horticulture in human welfare.
- Understand the propagation and cultural practices of useful vegetable, fruit and garden plants.
- Understand the impact of modern technologies in biology on horticultural plants.
- Understand the basic concepts of landscaping and garden designing.
- Inculcate interest in landscaping, gardening and flower and fruit culture.

HORTICULTURE (48 hrs)

Module 1: Introduction (10 hrs)

Introduction to horticulture: definition, history; classification of horticultural plants, disciplines of horticulture. Soil: formation, composition, types, texture, pH and conductivity. Garden tools and implements.

Preparation of nursery bed; manures and fertilizers - farm yard manure, compost, vermicompost, biofertilizers; chemical fertilizers - NPK; time and application of manures and fertilizers, foliar spray. Irrigation methods - surface, sub, drip and spray irrigations - advantages and disadvantages - periodicity of irrigation.

Module 2: Propagation of plants (10 hrs)

Propagation of horticultural plants - by seeds; seed development and viability, seed dormancy, seed health, seed testing and certification. Growing seedlings in indoor containers and field nurseries, seed bed preparation, seedling transplanting; advantages and disadvantages of seed propagation.

Vegetative propagation - organs used in propagation - natural and artificial vegetative propagation; methods - cutting, layering, grafting and budding; advantages and disadvantages of vegetative propagation; micropropagation.

Module 3: Gardening (10 hrs)

Gardening - ornamental gardens, indoor gardens, kitchen gardens- terrestrial and aquatic gardens - garden adornments; garden designing; garden components - lawns, shrubs and trees, borders, hedges, edges, drives, walks, topiary, trophy, rockery; famous gardens of India. Landscape architecture - home landscape design, urban planning, parks, landscaping and public buildings, industrial and highway landscaping. Physical control of plant growth - training and pruning - selection of plant, bonsai containers and method of bonsai formation.

Module 4: Floriculture (6 hrs)

Introduction, commercial floriculture - jasmine, orchid, anthurium, rose, gladiolus; production of cut flowers, quality maintenance, packing, marketing. Flower arrangements - basic styles - upright and slanting - japanese ikebana, dry flower arrangement.

Module 5: Olericulture (4 hrs)

Olericulture - types of vegetable growing - home gardens and market gardens; cultivation practices of leafy vegetable (Amarathus), tuber (Potato), fruit (Tomato), flower (Cauliflower).

Module 6: Pomology (4 hrs)

Pomology - cultivation of fruit crops - mango, banana and pine apple - preparation of land, spacing, planting, irrigation, hormones, harvest and storage. Factors affecting duration of storage. Principles of preservation - temporary and permanent - agents for fruit preservation. Preparation of pickles, jams, jellies and squashes using locally available fruits.

Module 7: Gardening – additional features (4 hrs)

Garden friends - honey bees, ladybirds, frogs, spiders, earthworms, centipedes and millipedes. Garden foes - pests, pathogenic fungi, bacteria, virus. Control measures - pesticides and fungicides; neem tobacco decoction. Hazards of chemical pesticides; equipments used in controlling horticultural pests - sprayers, dusting equipments - sterilization, fumigation.

Weeds - annual, perennial; weed control - prevention, eradication - hand weeding, tillage, burning, mowing, biological control, use of herbicides - selective and non selective - mechanisms involved in herbicidal actions.

NURSERY MANAGEMENT (6 hrs)

Module 1: Nurseries (6 hrs)

Nursery: definition, types; management strategies - planning, layout, budgeting - production unit, sales unit. Plant growing structures - green houses, fernery, orchidarium, arboretium.

ON HAND TRAINING (18 hrs)

1. Preparation of potting mixture of known combination and potting in earthen pots/poly bags.
2. Preparation of nursery beds.
3. Preparation of compost/vermicompost using different substrates.
4. Working knowledge and identification of garden tools and implements.
5. Practical knowledge in different plant propagation techniques listed in syllabus.
6. Cultivation of a vegetable/ornamental plant/fruit crop listed in the syllabus.
7. Practice of different pruning operations (top dressing, shaping and topiary) in the following plants: (1) Bougainvillea (2) Phyllanthus.
8. Visit a well established nursery and submit report.

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MAHATMA GANDHI UNIVERSITY

B.Sc. BOTANY PROGRAMME

Semester VI

Course 11

BO6B011U

**ANGIOSPERM MORPHOLOGY,
SYSTEMATIC BOTANY AND ECONOMIC BOTANY**

(Theory 54 hours; Practical : 45 hours)

(Theory Credit 3, Practical Credit1)

Course objectives:-

1. Acquaint with the aims, objectives and significance of taxonomy.
2. Identify the common species of plants growing in Kerala and their systematic position.
3. Develop inductive and deductive reasoning ability.
4. Acquaint with the basic technique in the preparation of herbarium.
5. Familiarizing with the plants having immense economic importance.

Module-1.

(Theory 6 hours; Practical : 6 hours)

Morphology .

Unit 1 Leaf Morphology (types, venation, phyllotaxy),

Unit 2 Morphology of flower

1. Parts of a flower- description of flower and it's parts in technical terms.
2. Flower as modified shoot.
3. Types of flower – Hypogyny, Perigyny and Epigyny, Symmetry of flowers.
4. Aestivation types.
5. Placentation types.
6. Floral Diagram and Floral Formula.

Unit 2

1. Inflorescence:-
 - (a) Racemose types-Simple Raceme, Corymb, Umbel, Spike, Spadix and Head.
 - (b) Cymose types-Simple Cyme, Monochasial- Scorpid and Helicoid, Dichasial
 - (c) Special type- Cyathium, Hypanthodium
2. Fruits: – Simple-Fleshy, Dry- dehiscent, indehiscent, Aggregate, Multiple(Sorosis and Syconus)

Module- 2.

(Theory 40 hours)

Systematic Botany

Unit 1 Aim, Scope and Significance

1 hour

Unit 2. Types of Classification- Artificial (Brief account), Natural – Bentham and Hooker(Detailed account) and Phylogenetic (Brief account) **3 hours**

Unit 3. Binomial Nomenclature, ICBN- Brief account

1 hour

Unit 4. Interdisciplinary approach in Taxonomy- Cytotaxonomy and Chemotaxonomy.

1hour

Unit 5. Herbarium technique- Preparation of herbarium, their preservation. Important herbaria, Botanical Gardens and BSI.

2 hours

Unit 6. Family studies: -

32 hours

Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Special attention should be given to common and economically important plants within the families

Annonaceae, Nymphaeaceae, Malvaceae, Sterculiaceae, Rutaceae, Meliaceae, Anacardiaceae, Leguminosae (Mimosaceae, Caesalpiniaceae and Fabaceae), Combretaceae, Myrtaceae, Cucurbitaceae, Apiaceae, Rubiaceae, Compositae (Asteraceae), Sapotaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Convolvulaceae, Scrophulariaceae, Acanthaceae, Verbenaceae, Lamiaceae (Labiatae), Amaranthaceae, Euphorbiaceae, Orchidaceae, Liliaceae, Arecaceae, Graminae (Poaceae)

Module- 3

(Theory 8 hours)

Economic botany

6 hours

Unit 1. Study of the following groups of plants based on their uses with special reference to the botanical name, family and morphology of the useful part

Cereals- Rice, Wheat

Millets- Ragi

Pulses- Green gram, Bengal gram, Black gram

Sugar yielding plants – Sugarcane

Fruits:- Apple, Pineapple, Orange, Mango and Banana

Vegetables:- Bittergourd, Ladies finger, Carrot and Cabbage.

Timber yielding plants:- Teak wood and Jack wood

Beverages- Tea, Coffee

Fibre yielding plants- Coir, Jute, Cotton

Oil yielding plants- Ground nut, Gingelly

Rubber yielding plants- Para rubber

Gums and Resins- White damer, Gum Arabic, Asafoetida

Spices – Cardamom, Pepper, Cloves , Ginger

Insecticide yielding Plants- Tobacco and Neem

Unit 2. Ethnobotany and it's significance.

2 hours.

Study of the following plants used in daily life by tribals and village folks for Food, Shelter and Medicine

Food :- *Artocarpus, Corypha, Phoenix*

Shelter - *Bamboosa, Ochlandra and Calamus*

Medicine - *Curcuma, Trichopus zeylanicus and Alpinia galangal*

Practicals

45 hours.

1. Identify the following inflorescence and fruits:-
 - (a) Inflorescence - Simple raceme, Spike, Corymb, Head, Dichasial cyme and Cyathium.
 - (b) Fruits - Simple: - Nut, Legume, Berry and Drupe Multiple and Aggregate
2. Preparation of floral formula from floral description.
3. Identify the families mentioned in the syllabus by noting their key, vegetative and floral characters.
4. Students must describe the floral parts, draw the L.S., floral diagram and write the floral formula of at least one flower from each family.
5. Study the finished products of plants mentioned in the syllabus of economic botany with special reference to the morphology, botanical name and family.
6. Prepare herbarium of 25 plants with field notes.
7. Conduct field work for a minimum of 5 days under the guidance of a teacher
8. Identify and describe the ethnobotanical uses of the items mentioned in the syllabus.

Suggested additional topics

1. Interdisciplinary approach in Taxonomy, Molecular taxonomy, Numerical taxonomy, Barcoding for species identification and Taxonomy for biodiversity characterization.
2. Binomial nomenclature- Historical account, ICBN, Principles and major rules in – Type concept, priority, valid publication, author citation.

References

1. Ashok Bendra and Ashok Kumar ,1980. *Economic botany.*: Rastogi publications, Meerut.
2. Cornquist A. ,1968. *The evolution and Classification of FloweringPlants.*
3. Davis P.H and Heywood V.H. 1967 *Principles of Angiosperm Taxonomy.* Edinburgh: Oliver and Boyl.
4. Eames A.J. 1961 *Morphology of Angiosperms.* New York: Mc Graw Hill.
5. Foaster A.S. and Giffad E.M. 1962 *Comparative Morphology of Vascular Plants.* Allied Pacific Pvt. Ltd. Bombay.

MAHATMA GANDHI UNIVERSITY

B.Sc. BOTANY PROGRAMME

Semester VI

Course 12

B06B012

BIOTECHNOLOGY AND BIOINFORMATICS

(Theory 54 hours; Practical : 45hours) (Theory Credit 3, Practical Credit1)

COURSE OBJECTIVES

1. Familiarize with the fundamental principles of biotechnology, various developments in biotechnology and potential applications.
2. Make aware that the life forms and activities can be exploited for human advancement.
3. Impart an introductory knowledge about bio informatics to the students.
4. Use of computers to handle biological data base.

BIOTECHNOLOGY

(Theory 36 hours ; Practical 26 hours)

Module-1

10 hours

1. Introduction – The concept of biotechnology, landmarks in biotechnology.
2. Plant tissue culture – Principles and techniques.
Cellular totipotency, *in vitro* differentiation –de differentiation and re-differentiation , callus induction, organogenesis and somatic embryogenesis.
3. Tissue culture medium – Basic components in tissue culture medium – Solid and liquid medium – suspension culture. Murashige and Skoog medium – composition and preparation. Aseptic techniques in tissue culture – sterilization – different methods – sterilization of instruments and glass wares, medium, explants; working principle of laminar air flow and autoclave; preparation of explants – surface sterilization. Inoculation, incubation, subculturing.
4. Micropropagation - Different methods – axillary bud proliferation, direct and indirect organogenesis and somatic embryogenesis. Different phases of micropropagation – hardening, transplantation and field evaluation Advantages and disadvantages of micropropagation. Somaclonal variation.

Module – 2

10 hours

1. *Methods and Applications* of tissue culture - Shoot tip and meristem culture
Synthetic seed production, embryo culture, *In vitro* mutagenesis, Protoplast

isolation culture and regeneration – transformation and transgenics, Somatic cell hybridization- cybrids. *In vitro* secondary metabolite production — cell immobilization, bioreactors *In vitro* production of haploids – anther and pollen culture, *In vitro* preservation of germplasm.

Module – 3

8 hours

Recombinant DNA Technology

Gene cloning strategies – recombinant DNA construction – cloning vectors – plasmids pBR322, bacteriophage based vectors, Ti plasmids. Restriction endonucleases and ligases – Ligation techniques, transformation and selection of transformants – using antibiotic resistances markers, southern blotting; PCR.

Different methods of gene transfer – chemically stimulated DNA uptake by protoplast, transduction, electroporation, microinjection, microprojectiles, *Agrobacterium* mediated gene transfer gene library ,gene banks.

Module – 4

3 hours

Application of Biotechnology in :

Medicine - Production of human insulin, human growth hormone and vaccines, gene therapy, monoclonal antibodies, biopharming.

Forensics - DNA finger printing.

Agriculture - Genetically modified crops – Bt crops, Golden rice, Flavr Savr Tomato, Virus herbicide resistant crops, Edible vaccines.

Environment - Bioremediation- use of genetically engineered bacteria- super bug.

Industry - Horticulture and Floriculture Industry, production of vitamins, amino acids and alcohol.

Module – 5

3 hours

Scope and relevance of the following technologies(Methodology not required)

Microbial biotechnology, Tissue Engineering technology, Embryonic stem cell culture, animal cloning, Micro array technology, Bionanotechnology.

Module-6

2 hours

Social and ethical issues, biosafety , biowar, patenting and IPR issues.

PRACTICALS

32 hours

1. Preparation of nutrient medium – Murashige and Skoog medium, sterilization, preparation of explants, inoculation.
2. Extraction of DNA from plant tissue.
3. Immobilization of whole cells or tissues in sodium alginate.
4. Determination of appropriate flower bud containing uninucleate pollen for anther culture using cytological techniques
5. Study of genetic engineering tools and techniques using photographs/diagram (Southern blotting, DNA finger printing, PCR,)
6. Visit a well equipped biotechnology lab and submit a report along with the practical record.

REFERENCES :

1. Attwood TK & Parry, Smith DJ. 2003. *Introduction to Bioinformatics*. Pearson Education.
2. Balasubramanian, D. – Bryce CFA , Dharmalingam K. Green J, Kunthala Jayaraman, 2007. *Concepts in Biotechnology* – University Press India Pvt. Ltd.
3. Becker JM, Coldwell GA and Zachgo EA. 2007. *Biotechnology – A Laboratory Course* Academic Press.



CONSOLIDATED SCHEME FOR I TO VI SEMESTERS PROGRAMME STRUCTURE

1. B.Sc CHEMISTRY PROGRAMME – (MODEL - I)

Sem	Title with Course code	Course Category	Hours per week	Credits
I	English I	Common	5	4
	English/ Common Course I	Common	4	3
	Second Language I	Common	4	4
	CHICRT01 General and Analytical Chemistry	Core	2	2
	CH2CRP01 Volumetric Analysis	Core	2	-
	Complementary Mathematics	Complementary	4	3
	Complementary Physics	Complementary	2	2
	Complementary Physics Practical	Complementary	2	-
II	English II	Common	5	4
	English/ Common Course II	Common	4	3
	Second Language II	Common	4	4
	CH2CRT02 Theoretical and Inorganic Chemistry	Core	2	2
	CH2CRP01 Volumetric Analysis	Core	2	2
	Complementary Mathematics	Complementary	4	3
	Complementary Physics	Complementary	2	2
	Complementary Physics Practical	Complementary	2	2
III	English III	Common	5	4
	II Lang/Common Course I	Common	5	4
	CH3CRT03 Organic Chemistry-I	Core	3	3
	CH4CRP02 Qualitative Organic Analysis	Core	2	-
	Complementary Mathematics	Complementary	5	4
	Complementary Physics	Complementary	3	3
	Complementary Physics Practical	Complementary	2	-
IV	English IV	Common	5	4
	II Lang/ Common Course II	Common	5	4
	CH4CRT04 Organic Chemistry-II	Core	3	3
	CH4CRP02 Qualitative Organic Analysis	Core	2	2
	Complementary Mathematics	Complementary	5	4
	Complementary Physics	Complementary	3	3
	Complementary Physical Practical	Complementary	2	2
V	CH5CRT05 Environment, Ecology and Human Rights	Core	4	4
	CH5CRT06 Organic Chemistry-III	Core	3	3
	CH5CRT07 Physical Chemistry - I	Core	2	2
	CH5CRT08 Physical Chemistry - II	Core	2	3
	CH5OPT Open course	Open	4	3



	CH6CRP03 Qualitative Inorganic Analysis	Core	3	-
	CH6CRP04 Organic Preparations and Basic Laboratory Techniques	Core	2	-
	CH6CRP05 Physical Chemistry Practical	Core	3	-
	CH6PRP01 Project	Core	2	-
VI	CH6CRT09 Inorganic Chemistry	Core	3	3
	CH6CRT10 Organic Chemistry-IV	Core	3	3
	CH6CRT11 Physical Chemistry - III	Core	3	3
	CH6CRT12 Physical Chemistry - IV	Core	3	3
	CH6CBT Choice Based Course	Core	3	3
	CH6CRP03 Qualitative Inorganic Analysis	Core	3	2
	CH6CRP04 Organic Preparations and Basic Laboratory Techniques	Core	2	2
	CH6CRP05 Physical Chemistry Practical	Core	3	2
	CH6CRP06 Gravimetric Analysis	Core	2	2
	CH6PRP01 Project & Industrial visit and comprehensive viva-voce	Core	-	2

OPEN COURSES:

Sl. No.	Semester	Course Code	Course Title
1	V	CH5OPT01	Chemistry in Everyday Life
2	V	CH5OPT02	Nanoscience and Nanotechnology
3	V	CH5OPT03	Forensic Science

CHOICE BASED COURSES:

Sl. No.	Semester	Course Code	Course Title
1	VI	CH6CBT01	Polymer Chemistry
2	VI	CH6CBT02	Nanochemistry and Nanotechnology
3	VI	CH6CBT03	Soil and Agricultural Chemistry

B.Sc. Chemistry

Semester –V

Type of Course	Course Code	Name of the Paper
Core	CH05BA901	Chemistry of d and f block elements
Core	CH05BA902	Basic Organic Chemistry -11
Core	CH05BA903	States of Matter
Core	CH05BA904	Quantum Mechanics and spectroscopy
Open Course		

Semester –VI

Type of Course	Course Code	Name of the Paper
Core	CH06BA901	Applied Inorganic Chemistry
Core	CH06BA902	Chemistry of natural products and biomolecules
Core	CH06BA903	Equilibrium and Kinetics
Core	CH06BA904	Solution Chemistry
Choice Based	CH06BB904	Polymer Chemistry
Practical	CH06BA905	Gravimetric Analysis
Practical	CH56BA901	Qualitative Inorganic Analysis
Practical	CH56BA902	Preparation and Basic Lab Skills
Practical	CH56BA903	Physical Chemistry Practical
Project	CH06BA907	Project/Dissertation

MATHEMATICS CORE COURSES

Semester	Title of the Course	Number Of hours	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
I	MM1CRT01: Foundation of Mathematics	4	3	72	3 hrs	20	80
II	MM2CRT01: Analytic Geometry, Trigonometry and Differential Calculus	4	3	72	3 hrs	20	80
III	MM3CRT01: Calculus	5	4	90	3 hrs	20	80
IV	MM4CRT01: Vector Calculus, Theory of Numbers and Laplace transforms	5	4	90	3 hrs	20	80
V	MM5CRT01: Mathematical Analysis	6	4	108	3 hrs	20	80
	MM5CRT02: Differential Equations	6	4	108	3 hrs	20	80
	MM5CRT03: Abstract Algebra	5	4	90	3 hrs	20	80
	Human rights and Mathematics for Environmental Studies.	4	4	72	3 hrs	20	80
	Open course	4	3	72	3 hrs	20	80
VI	MM6CRT01 : Real Analysis	5	4	90	3 hrs	20	80
	MM6CRT02: Graph Theory and metric spaces	6	4	108	3 hrs	20	80
	MM6CRT03 : Complex Analysis	5	4	90	3 hrs	20	80
	MM6CRT04 : Linear Algebra	5	4	90	3 hrs	20	80
	Choice Based Course	4	4	72	3 hrs	20	80
	MM6PRT01 : Project	-	2	-	-	20	80

B. Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2017)

FIFTH SEMESTER

CODE : HUMAN RIGHTS AND MATHEMATICS FOR ENVIRONMENTAL STUDIES

CORE MODULE SYLLABUS FOR ENVIRONMENTAL STUDIES & HUMAN RIGHTS FOR UNDER GRADUATE COURSES OF ALL BRANCHES OF HIGHER EDUCATION

Vision

The importance of environmental science and environmental studies cannot be disputed. The need for sustainable development is a key to the future of mankind. Continuing problems of pollution, solid waste disposal, degradation of environment, issues like economic productivity and national security, Global warming, the depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues. The United Nations Conference on Environment and Development held in Rio de Janeiro in 1992 and World Summit on Sustainable Development at Johannesburg in 2002 have drawn the attention of people around the globe to the deteriorating condition of our environment. It is clear that no citizen of the earth can afford to be ignorant of environment issues..

India is rich in biodiversity which provides various resources for people. Only about 1.7 million living organisms have been described and named globally. Still many more remain to be identified and described. Attempts are made to conserve them in ex-situ and in-situ situations. Intellectual property rights (IPRs) have become important in a biodiversity-rich country like India to protect microbes, plants and animals that have useful genetic properties. Destruction of habitats, over-use of energy resource and environmental pollution have been found to be responsible for the loss of a large number of life-forms. It is feared that a large proportion of life on earth may get wiped out in the near future.

In spite of the deteriorating status of the environment, study of environment has so far not received adequate attention in our academic programme. Recognizing this, the Hon'ble Supreme Court directed the UGC to introduce a basic course on environment at every level in college education. Accordingly, the matter was considered by UGC and it was decided that a six months compulsory core module course in environmental studies may be prepared and compulsorily implemented in all the University/Colleges of India.

The syllabus of environmental studies includes five modules including human rights. The first two modules are purely environmental studies according to the UGC directions. The second two modules are strictly related with the core subject and fifth module is for human rights.

Objectives

- Environmental Education encourages students to research, investigate how and why things happen, and make their own decisions about complex environmental issues. By developing and enhancing critical and creative thinking skills, It helps to foster a new generation of informed consumers, workers, as well as policy or decision makers.
- Environmental Education helps students to understand how their decisions and actions affect the environment, builds knowledge and skills necessary to address complex environmental issues, as well as ways we can take action to keep our environment healthy and sustainable for the future, encourage character building, and develop positive attitudes and values.
- To develop the sense of awareness among the students about the environment and its various problems and to help the students in realizing the inter-relationship between man and environment for protecting the nature and natural resources.

- To help the students in acquiring the basic knowledge about environment and to inform the students about the social norms that provide unity with environmental characteristics and create positive attitude about the environment.

4 hours/week (Total Hrs: 72)

4 credits

SYLLABUS

Text Book :

1. **Thomas Koshy : Fibonacci and Lucas numbers with applications, John Wiley & Sons, Inc (2001).**

Unit 1 :Multidisciplinary nature of environmental studies

Definition, scope and importance
Need for public awareness.

(2 hrs)

Unit 2 : Natural Resources :

Renewable and non-renewable resources : Natural resources and associated problems.

a) **Forest resources** : Use and over-exploitation, deforestation, case studies.

Timber extraction, mining, dams and their effects on forest and tribal people.

b) **Water resources** : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) **Mineral resources** : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) **Food resources** : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) **Energy resources**: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.

f) **Land resources**: Land as a resource, land degradation, man induced landslides, soil erosion and desertification

- Role of individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

(10 hrs)

Unit 3: Ecosystems

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the given ecosystem:-
Forest ecosystem

(6 hrs)

ModuleII

Unit 1: Biodiversity and its conservation

- Introduction
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts
- Endangered and endemic species of India

(8 hrs)

Unit 2: Environmental Pollution

Definition

Causes, effects and control measures of: -

- Air pollution
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear hazards
 - Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
 - Role of an individual in prevention of pollution
 - Pollution case studies
 - Disaster management: floods, earthquake, cyclone and landslides.

(8hrs)

Unit 3: Social Issues and the Environment

- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people: its problems and concerns, Case studies
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies
- Consumerism and waste products
- Environment Protection Act
- Air (Prevention and Control of Pollution) Act
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

(10 hrs)

Module III : Fibonacci Numbers in nature

The rabbit problem, Fibonacci numbers, recursive definition, Lucas numbers, Different types of Fibonacci and Lucas numbers. Fibonacci numbers in nature : Fibonacci and the earth, Fibonacci

and flowers, Fibonacci and sunflower, Fibonacci, pinecones, artichokes and pineapples, Fibonacci and bees, Fibonacci and subsets, Fibonacci and sewage treatment, Fibonacci and atoms, Fibonacci and reflections, Fibonacci, paraffins and cycloparaffins, Fibonacci and music, Fibonacci and compositions with 1's and 2's.

Text 1 : Chapters 2 & 3 (excluding Fibonacci and poetry, Fibonacci and electrical networks)

Module IV : Golden Ratio (10 Hrs)

The golden ratio, mean proportional, a geometric interpretation, ruler and compass construction, Euler construction, generation by Newton's method. The golden ratio revisited, the golden ratio and human body, golden ratio by origami, Differential equations, Gattei's discovery of golden ratio, centroids of circles,

Text 1 : Chapters 20, 21

Module V : Human rights

Unit1-Human Rights– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).

Unit-2 Human Rights and United Nations – contributions, main human rights related organs - UNESCO, UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights.

Human Rights in India – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities

Unit-3 Environment and Human Rights - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment

Conservation of natural resources and human rights: Reports, Case studies and policy formulation. Conservation issues of western ghats- mention Gadgil committee report, Kasthurirengan report. Over exploitation of ground water resources, marine fisheries, sand mining etc. **(8 Hrs)**

Internal: Field study

- Visit to a local area to document environmental grassland/ hill /mountain
- Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc
- Study of simple ecosystem-pond, river, hill slopes, etc

(Field work Equal to 5 lecture hours)

References

B.Sc. Mathematics

Semester –V

Type of Course	Course Code	Name of the Paper
Core	MT05BAA01	Mathematical Analysis
Core	MT05BAA02	Differential Equations
Core	MT05BAA03	Abstract Algebra
Core	MT05BAA06	Fuzzy Mathematics
Open Course		

Semester –VI

Type of Course	Course Code	Name of the Paper
Core	MT06BAA01	Real Analysis
Core	MT06BAA02	Complex Analysis
Core	MT06BAA03	Discrete Mathematics
Core	MT05BAB03	Linear Algebra And Metric Spaces
Project	MT06BBA02	Project
Choice – Based	MT06BBA03	Operations Research

7. CONSOLIDATED SCHEME FOR I TO VI SEMESTERS

B. Sc. Physics Programme – (Model I)

Semester	Title of the Course	Hours/week	Credits	Total hrs	Marks		
					IA	EA	
1	English (Common Course I) EN1CCT01 – Fine Tune Your English	5	4	90	20	80	
	English (Common Course II) EN1CCTO2 – Pearls From the Deep	4	3	72	20	80	
	Second Language I	4	4	72	20	80	
	PH1CRT01 - Methodology and Perspectives of Physics	2	2	36	15	60	
	Complementary I: Mathematics I	4	3	72	20	80	
	Complementary II	Chemistry I or Electronics I	2	2	36	15	60
		Or Statistics I (No Practical)**	4	3	72	20	80
	Core Practical I: PH2CRP01 Mechanics and Properties of Matter	2	-	36	-	-	
	Complementary II Practical I (Chemistry or Electronics)	2	-	36	-	-	
2	English (Common Course III) EN2CCT03 – Issues that Matter	5	4	90	20	80	
	English (Common Course IV) EN2CCTO4 – Savouring the Classics	4	3	72	20	80	
	Second Language II	4	4	72	20	80	
	PH2CRT02 – Mechanics and Properties of Matter	2	2	36	15	60	
	Complementary I: Mathematics II	4	3	72	20	80	
	Complementary II:	Chemistry II or Electronics II	2	2	36	15	60
		Or Statistics II**	4	3	72	20	80
	Core Practical I: PH2CRP01 Mechanics and Properties of Matter	2	2	36	10	40	
	Complementary II Practical I (Chemistry or	2	2	36	10	40	

	Electronics)						
3	English (Common Course V) EN3CCTO5 – Literature and / as Identity	5	4	90	20	80	
	Second Language III	5	4	90	20	80	
	PH3CRT03 – Optics, Laser and Fiber Optics	3	3	54	15	60	
	Complementary I: Mathematics III	5	4	90	20	80	
	Complementary II:	Chemistry III or Electronics III	3	3	54	15	60
		Or Statistics III**	5	4	90	20	80
	Core Practical II: PH4CRP02 Optics and Semiconductor Physics	2	-	36	-	-	
Complementary II Practical II (Chemistry or Electronics)	2	-	36	-	-		
4	English (Common Course VI) EN4CCTO6 - Illuminations	5	4	90	20	80	
	Second Language IV	5	4	90	20	80	
	PH4CRT04- Semiconductor Physics	3	3	54	15	60	
	Complementary I: Mathematics IV	5	4	90	20	80	
	Complementary II:	Chemistry IV or Electronics IV	3	3	54	15	60
		Or Statistics IV**	5	4	90	20	80
	Core Practical II: PH4CRP02 Optics and Semiconductor Physics	2	2	36	10	40	
Complementary II Practical II (Chemistry or Electronics)	2	2	36	10	40		
5	PH5CRT05 – Electricity and Electrodynamics	3	3	54	15	60	
	PH5CRT06 – Classical and Quantum Mechanics	3	3	54	15	60	
	PH5CRT07 –Digital Electronics and Programming	3	3	54	15	60	
	PH5CRT08 – Environmental Physics and Human Rights	4	4	72	15	60	
	PH5OPT0X* -Open Course	4	3	72	20	80	
	Core Practical III: PH6CRP03 Electricity, Magnetism and Laser	2	-	36	-	-	
	Core Practical IV: PH6CRP04 Digital Electronics	2	-	36	-	-	
	Core Practical V: PH6CRP05 Thermal Physics, Spectroscopy and C++ programming	2	-	36	-	-	
	Core Practical VI: PH6CRP06	2	-	36	-	-	

	Acoustics, Photonics and Advanced Semiconductor Physics					
6	PH6CRT09- Thermal and Statistical Physics	3	3	54	15	60
	PH6CRT10 --Relativity and Spectroscopy	4	3	72	15	60
	PH6CRT11 – Nuclear, Particle and Astrophysics	3	3	54	15	60
	PH6CRT12- Solid State Physics	4	3	72	15	60
	PH6CBT0X *-Choice Based Course	3	3	54	20	80
	Core Practical III: PH6CRP03 Electricity, Magnetism and Laser	2	2	36	10	40
	Core Practical IV: PH6CRP04 Digital Electronics	2	2	36	10	40
	Core Practical V: PH6CRP05 Thermal Physics, Spectroscopy and C++ programming	2	2	36	10	40
	Core Practical VI: PH6CRP06 Acoustics, Photonics and Advanced Semiconductor Physics	2	2	36	10	40
PH6PRO01 – Project and Industrial Visit	-	1	-	20	80	

*- X Stands for 1, 2, 3, ... depending upon Open course and Choice based course

** Complementary II : Statistics has only theory papers.

Choice Based Course

Sl. No.	Paper Code	Semester	Paper Title
1	PH6CBT01	VI	IT
2	PH6CBT02	VI	Material Science
3	PH6CBT03	VI	Computational Physics
4	PH6CBT04	VI	Instrumentation
5	PH6CBT05	VI	Astronomy & Astrophysics

SCHEME: CORE COURSES (Common for the Programme)

Semester	Title of the Course	Number of hours per week	Number of credits	Total Credits	Total hours/ semester
1	PH1B01U– Methodology in Physics	2	2	3	72
	Practical	2	1		
2	PH2B01U - Mechanics and Properties of Matter	2	2	3	72
	Practical	2	1		
3	PH3B01U – Electronics	3	3	4	90
	Practical	2	1		
4	PH4B01U – Electricity and Electrodynamics	3	3	4	90
	Practical	2	1		
5	PH5B01U – Classical and Quantum Mechanics	3	3	4	90
	Practical	2	1		
	PH5B02U – Physical Optics and Photonics	3	3	4	90
	Practical	2	1		
	PH5B03U – Thermal and Statistical Physics	3	3	4	90
	Practical	2	1		
	PH5B04U– Digital Electronics	3	3	4	90
	Practical	2	1		
	PH5B05U Project	1	1	1	18
	PH5D01U – Open course	4	4	4	72
6	PH6B01U- Computational Physics	3	3	4	90
	Practical	2	1		
	PH6B02U – Nuclear and Particle Physics	3	3	4	90
	Practical	2	1		
	PH6B03U - Condensed Matter Physics	3	3	4	90
	Practical	2	1		
	PH6B04U - Relativity and Spectroscopy.	3	3	4	90
	Practical	2	1		
	PH6B05U– Choice Based Course	5	3	3	90



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CURRICULUM OF
CHOICE BASED CREDIT SYSTEM
FOR
UNDERGRADUATE
ZOOLOGY PROGRAMME
2017 ADMISSION ONWARDS

Semester 5

No	Course Code	Course Title	Course Category	Hrs per week	Credits	Marks ratio	
						Intl	Extl
1	ZY5CRT05	Environmental Biology & Human rights	Core Course V : Theory	3	3	1	4
2	ZY5CRPO5	Environmental Biology & Human rights	Core Course V : Practical	2	0	0	0
3	ZY5CRT06	Cell Biology & Genetics	Core Course VI : Theory	3	3	1	4
4	ZY5CRPO6	Cell Biology & Genetics	Core Course VI : Practical	2	0	0	0
5	ZY5CRT07	Evolution, Ethology & Zoogeography	Core Course VII : Theory	3	3	1	4
6	ZY5CRPO7	Evolution, Ethology & Zoogeography	Core Course VII : Practical	2	0	0	0
7	ZY5CRT08	Human Physiology, Biochemistry & Endocrinology	Core Course VIII : Theory	3	3	1	4
8	ZY5CRPO8	Human Physiology, Biochemistry & Endocrinology	Core Course VIII : Practical	2	0	0	0
9	ZY5OPT01	1 – Vocational Zoology (Apiculture, Vermiculture, Ornamental fish culture)	Open Courses for other streams (<i>Select any one out of three</i>)	4	3	1	4
	ZY5OPT02	2 – Public health and Nutrition					
	ZY5OPT03	3 – Man, nature & Sustainable Development					
10	ZY6CRPRP	Project work (Credit 2 will be given in 6 th semester with investigatory project).	Project	1	0		
Total				25 hrs	15		

Semester 6

No	Course Code	Course Title	Course Category	Hrs per week	Credits	Marks ratio	
						Intl	Extl
1	ZY6CRT09	Developmental Biology	Core Course IX : Theory	3	3	1	4
2	ZY6CRP09	Developmental Biology	Core Course IX : Practical	2	2	1	4
3	ZY6CRT10	Microbiology & Immunology	Core Course X : Theory	3	3	1	4
4	ZY6CRP10	Microbiology & Immunology	Core Course X : Practical	2	2	1	4
5	ZY6CRT11	Biotechnology, Bioinformatics and Molecular Biology	Core Course XI : Theory	3	3	1	4
6	ZY6CRP11	Biotechnology, Bioinformatics and Molecular Biology	Core Course XI : Practical	2	2	1	4
7	ZY6CRT12	Occupational Zoology (Aquaculture, Apiculture, Vermiculture & Quail farming)	Core Course XII : Theory	3	3	1	4
8	ZY6CRP12	Occupational Zoology (Aquaculture, Apiculture, Vermiculture & Quail farming)	Core Course XII : Practical	2	2	1	4
9	ZY6CBT01	Elective 1: Ecotourism & Sustainable Development	Choice Based Core Elective Courses (<i>Select any one out of four</i>)	4	3	1	4
	ZY6CBT02	Elective 2: Agricultural pest management					
	ZY6CBT03	Elective 3: Vector & Vector borne Diseases					
	ZY6CBT04	Elective 4: Nutrition, Health & life style management					
10	ZY6PRP01	Project Work	Project	1	2		
Total				25 hrs	25		

SEMESTER V. ZY5CRT05

CORE COURSE V

ENVIRONMENTAL BIOLOGY AND HUMAN RIGHTS

54 Hrs

Objectives

To instill the basic concepts of Environmental Sciences, Ecosystems, Natural Resources, Population, Environment and Society

To make the students aware of natural resources, their protection, conservation, the factors polluting the environment, their impacts and control measures.

To teach the basic concepts of toxicology, their impact on human health and remedial measures

To create a consciousness regarding Biodiversity, environmental issues & conservation strategies

To develop the real sense of Human rights – its concepts & manifestations

MODULE 1 ECOSYSTEM

12 Hrs

Basic concepts of ecosystem Components of ecosystem: Abiotic (Sunlight, temperature, soil, water, atmosphere) and Biotic components (Producers, consumers, decomposers), Ecological pyramid- number, biomass, energy, **Functions of ecosystem:** Productivity-Food chain-Food web-Energy flow-Laws of Thermodynamics.Types of Ecosystem: Terrestrial-Forest-Grassland-Desert, Aquatic-Marine-Fresh water, Wetland &Biome **Concept of limiting factors:** Liebig's and Shelford's laws of limiting factors.

Biogeochemical cycles: Concept, gaseous and sedimentary cycles, Carbon cycle, Nitrogen cycle.

Renewable resources (solar,wind, hydroelectric, biomass and geothermal) **and Non renewable resources** (mineral and metal ore, fossil fuels)

MODULE 2 CONCEPTS OF POPULATION AND COMMUNITY 8 Hrs

Concept of population: Population attributes- Population growth forms, Basic concepts of growth rates, density, natality, mortality, growth curves

Animal interactions: Positive- Commensalism- Mutualism-Protocooperation, Negative-Predation-Parasitism-Competition-Antibiosis

Characteristics of a community: Species diversity- richness, evenness, stratification, dominance, ecological indicators, Ecotone and Edge effect, Keystone species, Concepts of Ecological Niche and Guild, Ecological succession, community evolution- climax.

MODULE 3 BIODIVERSITY AND ENVIRONMENTAL ISSUES 16 Hrs

Introduction to Biodiversity: Types of biodiversity- Alpha, Beta and Gamma diversity. **Concept and importance of Biodiversity:** Levels of Biodiversity-Species diversity, Genetic diversity, Microbial, Ecosystem diversity, India as a mega-diversity nation, Biodiversity hotspots

Global Environmental Issues: Ozone depletion, Greenhouse effect, Global warming, Climate change, Carbon trading, carbon credit; Carbon sequestration, Acid rain, Oil spills, Nuclear accidents, IPCC/UNFCCC.

National Environmental issues: Deforestation, forest fire, pollution(air, water, soil, noise thermal, nuclear- brief account only) solid waste management, sewage, drinking water crisis and water logging,

Toxic products and disaster: Types of toxic substances – degradable, non degradable, Impact on human – case studies: Endosulphan tragedy, Bhopal disaster

Flood, drought, cyclone, earthquake and landslide (Management and mitigation)

Local Environmental issues: Landscape alteration, sand mining, quarrying, changing crop pattern, conversion of paddy lands,

Threats to water resources of Kerala: Degrading Mangrove and wetland ecosystems of Kerala, RAMSAR sites, Marine ecosystem crisis- pollution, overfishing etc. Impact of tourism on Environment.

MODULE 4 CONSERVATION OF BIODIVERSITY

12 Hrs

Protected area concept – Sanctuary, National Park, Biosphere reserve, Core Zone, Buffer Zone, Corridor concept. Conservation reserves

Concept of threatened fauna – IUCN categories - extinct, extinct in the wild, critically endangered, endangered, vulnerable, near threatened, least concern and data deficient. Red and Green Data Books.

Man–animal conflict (Tiger, Elephant, Dog, Monkey) – causes and concern

Water conservation- rainwater harvesting, watershed management

Environment education

Environmental laws (Brief account only): The Water (Prevention and Control of Pollution) Act, 1974, The Air (Prevention and Control of Pollution) Act, 1981, Indian Forests Act (Revised) 1982. The Environment (Protection) Act, 1986, Hazardous Wastes (Management and Handling) Rules, 1989, The Forest (Conservation) Act, 1980, The Wildlife Protection Act, 1972, Biodiversity Act, 2002.

MODULE 5 HUMAN RIGHTS

6 Hrs

Introduction, main concepts associated with Human Rights, Different types of human rights, Manifestations & phenomena, Role of agencies in promoting human rights, Mechanisms for checking violations of human rights, National human right commission, Constitutional provisions related to Human rights.

References

1. Erach Bharucha 2008 (UGC). Text Book of Environmental Studies of Undergraduate course. University Press.
2. J.B Sharma (2009), Environmental studies' - 3rdEd. University science Press
3. Misra S.P., Pandey S.N. 2009 Essential Environmental Studies, Ane books Pvt. Ltd.
4. P.D Sharma (2012), Ecology and Environment' - 11th Ed. Rastogi Publications
5. R.B Singh & Suresh Mishra Paulami Maiti (1996), Biodiversity – Perception, Peril and Preservation' — PHI Learning , Environmental Law in India: Issues and Responses
6. Rajagopalan, R. 2005. *Environmental Studies from Crisis to Cure*. Oxford University Press, New Delhi.

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8. Arun kumar Palai (1999) National Human Rights Commission of India, Atlantic publishers
9. Sharma P.D. (2005) Environmental biology and Toxicology, Rastogi publication
10. Meera Asthana and Astana D.K. 1990 Environmental pollution and Toxicology Alka printers.
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12. Alan Beeby, 2006 Anne – Maria Brennan First Ecology, Ecological principles and Environmental issues . International students edition Sec. edition Oxford University Press.
13. Robert Ricklefs (2001). The Ecology of Nature. Fifth Edition. W.H. Freeman and Company.
14. Stiling Peter (2002). Ecology: Theories and applications. Prentice Hall of India pvt.Ltd. New Delhi.
15. Landis, Wayne and Hing-ho Yu, Boca Raton, 1995. Introduction to Environmental Toxicology: Impacts of chemicals upon Ecological systems: Lewis Publishers.

**PRACTICAL
ENVIRONMENTAL BIOLOGY & TOXICOLOGY**

36 HRS

CREDIT 1

1. Estimation of dissolved Oxygen
2. Estimation of carbon di oxide
3. Estimation of soil organic carbon (Demonstration only)
4. Identification of marine/ fresh water planktons
5. Counting of plankton using plankton counting chamber
6. Study of equipments - Sechi disc, Plankton net
7. Study of sandy shore fauna, rocky shore fauna.
8. Study of animal Association
9. Visit to any two important areas of bio diversity: 1. Forest, 2. Sea shore, 3. Mangrove, 3. Wet lands, 4. Bird sanctuary, 5. Wild life sanctuary, 6. Sacred groves
Field study (compulsory)

1. Identify and comment on the item provided: (Western blotting / Southern blotting / Northern blotting / PCR)
2. Write down the procedure involved in DNA isolation

BIOINFORMATICS

1. Download/use print out/pictures of genome sequences of any 2 organisms. Identify and mention the characteristic features of both.
2. Download/ use print out/pictures of a protein sequence , identify it & comment on its amino acid composition
3. Download / use print out/pictures of a macromolecule. Write a brief note on the bioinformatics tool used to visualize its structure.

MOLECULAR BIOLOGY

1. Identify and comment on its molecular composition / structural orientation / functional significance (Any tissue / Cell organelles/ DNA, DNA replication, RNA different types using models or diagrams)

V1 SEMESTER. ZY6CRT12

CORE COURSE XII

OCCUPATIONAL ZOOLOGY .

(APICULTURE, VERMICULTURE, QUAIL FARMING & AQUACULTURE)

54 Hrs

Credits 3

Objectives:

1. To equip the students with self employment capabilities.
2. To provide scientific knowledge of profitable farming.
3. To make the students aware of cottage industries.

Module 1. APICULTURE

18 Hrs

Definition, Different species of honey bees, Organization of honey bee colony, Social life and adaptation of honey bees. Communication among honey bees. Bee keeping methods and equipments, Management and maintenance of an apiary, Growth period, honey flow period and dearth period Division of the colony, uniting two colonies, , replacing old queen with new queen, swarming management, monsoon management. Enemies of bees. Diseases of bees,.Bee pasturage. Uses of honey bees, By-products of honey bees, Honey and wax composition. Testing the quality of honey.Extraction of wax, Uses of honey and wax.Royal jelly, Propolis. Apitherapy, Agencies supporting apiculture.

Activity : Visitto an apiculture unit.

Field visit and report submission - 10 Hrs

Field visit and report submission on any two items are taken for internal evaluation.

MODULE: 2. VERMICULTURE

8 Hrs

Introduction, Ecological classification of earth worms. Species of earth worms used for vermiculture, Reproduction & life cycle, Role of earth worm in solid waste management, in agriculture, in medicine etc. Preparation of vermibed, Maintenance & monitoring, Preparation of vermicompost, Preparation of vermiwash.

Activity : Submission of a report after preparing a vermiculture unit or visiting a vermicomposting unit.

MODULE: 3.QUAIL FARMING (*Coturnix coturnix*)

4 Hrs

Introduction, care of quail chicks, care of adult quails, care of breeding quails, ration for quail, care of hatching eggs, health care, use of quail egg and meat.Sources of quality chicks.

MODULE: 4. AQUACULTURE.

24 Hrs

Advantages and salient features of aquaculture, Types of Aquaculture, Biotic and abiotic features of water, Importance of algae in aquaculture, Common cultivable fishes of Kerala, Fish diseases, Composite fish culture, Integrated fish culture, Carp culture, Prawn culture Mussel culture Pearl culture. Processing & Preservation.

Aquarium management - Setting up of an aquarium, Biological filter & Aeration, Breeding of gold fish, gourami (*Osfrophonemus*), fighter and Guppy (live bearer). Nutrition and types of feed for aquarium fishes, Establishment of commercial ornamental fish culture unit. Fish Transportation - Live fish packing and transport Common diseases of aquarium fishes and their management. Aquaponics (a brief introduction only).

Activity – Setting up of an Aquarium

Field visit – Visiting an Aquaculture farm

References

- NPCS Board, The complete book on Bee keeping and honey processing, NIIR Project consultancy services, 106E, Kamala nagar, Delhi- 110007.
- Shukla G.S, & Updhyay V.B, Economic zoology ,Rastogi Publ. Meerut.
- Pradip.V.Jabde , Text book of applied zoology, 2005
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- Chauhan, H.V.S. Poultry, Disease, diagnosis and treatment, Wiley eastern Ltd Delhi.
- Otieno.F.O 2014. Quail farming: markets & market strategies
- Pillai T.V.R., Aquaculture, principles and practices.
- Ronald j. Roberts (1978) Fish pathology , Cassel Ltd London.
- Cowey C. B. *et. al.* (1985) Nutrition and feeding in fishes, academy press.
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- Harisankar J. Alappat& A. Bijukumar, Aquarium Fishes. B. R. Publ. Corporation, Delhi.
- MPEDA, A hand Book on AquafarmingOrnamentalfishes, MPEDA, Kochi.
- Amber Richards. 2014. Aquaponics at home.
- Pradip.V.Jabde. 1993. Text book of applied zoology
- Venkitaraman, P.R,1983, Text book of Economic zoology(SudharsanaPuubl. Kochi)
- Addison Webb, Bee Keepingfor profit and pleasure, Agrobios Ltd.
- Edwards.C.A.&Lafty, J.R.1972 Biology of earthworms(Chapman & Hall Led.London)
- Applied Zoology, Study Material Zoological Society of Kerala , CMS college Campus
- George cust& Peter Bird, Tropical Fresh water Aquaria, Hamlyn London.
- Verreth J. Fish larval nutrition, Chapman & Hall Publ.
- Bone Packer. 2014. Aquaponic system

OPEN COURSE (FOR OTHER STREAMS)

ZY5OPT02

2. PUBLIC HEALTH AND NUTRITION

72 Hrs

4hrs/Week

Credits 3

Objectives:

- To inculcate a general awareness among the students regarding the real sense of health.
- To understand the role of balanced diet in maintaining health.
- To motivate them to practice yoga and meditation in day-to-day life.

PART I HEALTH, EXERCISE & NUTRITION

Module 1 Definition and Meaning of Health

10 Hrs

Dimensions and Determination of Health

Physical Activity and Health benefits

Effect of exercise on body systems – Circulatory, Respiratory, Endocrine, Skeletal and Muscular

Programmes on Community health promotion (Individual, Family and Society) Dangers of alcoholic and drug abuse, medico-legal implications

Module 2 Nutrition and Health

10 Hrs

Concept of Food and Nutrition, Balanced diet

Vitamins, Malnutrition, Deficiency Disease

Determining Caloric intake and expenditure

Obesity, causes and preventing measures

Role of Diet and Exercise, BMI

Module 3 Safety Education in Health promotion

8 Hrs

Principles of Accident prevention

Health and Safety in daily life.

Health and Safety at work.

First aid and emergency care.

Common injuries and their management.
Modern life style and hypokinetic diseases.
Diabetese, Cardiovascular disorders-Prevention and Management.

Module 4 Life Skill Education 8 Hrs

Life skills, emotional adjustment and well being,. Yoga, Meditation and Relaxation, Psychoneuroimmunology

PART II PUBLIC HEALTH AND SANITATION

Module 5 Public health and water quality. 11 Hrs

Potable water, Health and Water quality
Faecal bacteriae and pathogenic microorganisms transmitted by water. Determination of sanitary quality of drinking water, water purification techniques

Module 6 Public health and diseases 15 Hrs

Water borne diseases-Cholera and Typhoid.Prevention of Water borne diseases.

Food borne diseases and Prevention

Botulinum, Salmenellosis, Hepatitis A

Vector borne diseases & Control measures

Chikungunya , Filariasis and Dengu fever

Zoonotic disease-Leptospirosis & its control

Emerging diseases - Swine flue (H1N1), bird flue (H5N1), SARS, Anthrax

Re-emerging diseases –TB, Malaria

Health Centre visit & Report Presentation 10 Hrs

References:

1. Gladys Francis & Mini K.D., (Editors) (2012), Microbiology, Zoological Society of Kerala, Kottayam.
2. Greenberg, Jerol S and Dintiman George B (1997) Wellness Creating a life of Health and Fitness , London Allyn and Bacon Inc.
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4. Norman Bezzaant HELP First Aid for everyday emergencies. Jaico Publishing House, Bombay, Delhi

- Richard T. Wright & Bernard J. Nebel. 2002. *Environmental Science-Toward a Sustainable future*. Pearson Education Inc. NY, USA.
- Rob DeSalle and Ian Tattersal. 2008. *Human Origins: What Bones and Genomes Tell Us about ourselves*. Texas A&M University Press, USA.
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- Strickberger, M.W. 2000. *Evolution*. Jones and Bartlett, Boston.
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SEMESTER VI.

ZOOLOGY CORE CHOICE BASED COURSES

FOR B.Sc. ZOOLOGY PROGRAMME

ZY6CBT01. ELECTIVE COURSE.

1. ECOTOURISM & SUSTAINABLE DEVELOPMENT

72 Hrs

4hrs/week

Credits 3

Objectives:

1. To introduce the concepts, principles and applications of tourism and its sustainability
2. To critically analyse the cost and benefits of ecotourism, including related laws and policies, community involvement and future trends
3. To develop an appreciation among students with respect to tourism development from the

sustainability perspective

4. To equip the students with basic knowledge for the emerging ecotourism industry

Module I. Fundamentals of Tourism **12 Hrs**

Introduction- Tourism, concepts and definitions

History, types, Characteristics

The facilitating sectors

Attractions

Geography, heritage

Wildlife, nature

Quality Control

Module II. Major areas of eco-tourism **10 Hrs**

Concepts, practices and case studies for each:

Marine tourism

Wildlife tourism

Adventure tourism

Module III. Emerging trends in eco-tourism **10Hrs**

Cultural tourism

Pilgrimage tourism

Farm tourism

Backwater tourism

Health tourism

Module IV. Problems and prospects of eco-tourism **10 Hrs**

Economics and benefits of ecotourism

Cultural issues and negative aspects of ecotourism

Environmental Impacts of Tourism

Module V. Sustainable tourism **12 Hrs**

Quality, Standards

Systems of sustainable tourism: environmental, sociocultural, Economical

Environment and conservation: basic principles

Current practices of eco-conservation in tourism industry

Sustainable tourism and society

Community based ecotourism

Eco-development committee (EDC) of Periyar Tiger Rerserve

People initiatives

Module VI. Eco-tourism guides **8 Hrs**

Ecotourism guiding and case studies

Activity

Field visit to Ecologically relevant places & Report writing **10 Hrs**

References

Bruner, E.M. 2005. *Culture on tour: ethnographies of travel*. The University of Chicago Press.

Ghimire, K.B. and M. Pimbert. 1997. *Social change and conservation: environmental politics and impacts of national parks and protected areas*. London: Earthscan Publications.

Karan Singh. 1980. *Indian Tourism: Aspects of great adventure*. Department of tourism. New Delhi.

Ratandeep Sing. 2003. *National Ecotourism and Wildlife tourism: Policies and guidelines*. Kanishka Publishers, New Delhi

Whelan, T. 1991. *Nature tourism: managing for the environment*. Washington, D.C.: Island Press.

Brian Garrod and Julie C. Wilson. 2002. *Marine Ecosystem*. Channel View Publications.

Ghimire, K.B. and M. Pimbert. 1997. *Social change and conservation: environmental politics and impacts of national parks and protected areas*. London: Earthscan Publications.

Ratandeep Sing. 2003. *National Ecotourism and Wildlife tourism: Policies and guidelines*. Kanishka Publishers, New Delhi

ELECTIVE COURSE . ZY6CBT02

2. AGRICULTURAL PEST MANAGEMENT **72 Hrs**

4 Hrs/week - 3 Credits

Objectives

1. To acquire basic skills in the observation and study of nature.
2. To impart basic awareness regarding pest problem and crop loss due to their dominance.
3. To inculcate interest in adopting biological control strategies for pest control.
4. To understand various pests affecting our local crops and select the best method for their control



MAHATMA GANDHI UNIVERSITY
PRIYADARSHINI HILLS, KOTTAYAM 686 560

**RESTRUCTURED CURRICULUM
AND SYLLABI IN
CHOICE BASED COURSE,
CREDIT AND SEMESTER SYSTEM
(CBCSS)**

BSc ZOOLOGY PROGRAMME

INTRODUCED FROM 2009 ADMISSION ONWARDS

(Modified syllabus for 2012 admission onwards)

BOARD OF STUDIES IN ZOOLOGY (UG)

Mahatma Gandhi University P D Hills Kottayam .Kerala.

CORE COURSES

SCHEME OF DISTRIBUTION OF HOURS AND CREDIT

Name of semester	Code	Name of core course	Hrs	Inst Hrs/ week	Credit
1	ZY1B01U	General Methodology and Perspectives in science	36	2	2
1	ZY1B01U [P]	(Practical)- General Methodology & instrumentation	36	2	1
2	ZY2B02U	Biodiversity & Modern systematics	36	2	2
2	ZY2B02U [P]	(Practical) Biodiversity & Modern systematics	36	2	1
3	ZY3B03U	Animal Diversity Non Chordata	54	3	3
3	ZY3B03U [P]	(Practical) Animal Diversity Non chordata	36	2	1
4	ZY4B04U	Animal Diversity Chordata	54	3	3
4	ZY4B04U [P]	(Practical) Animal Diversity – Chordata	36	2	1
5	ZY5B05U	Cell Biology and Molecular Biology	54	3	3

5	ZY5B05U [P]	(Practical) – Cell Biology and Molecular Biology	36	2	1
5	ZY5B06U	Environmental Biology, Toxicology and Disaster Management	54	3	3
5	ZY5B06U [P]	(Practical) – Environmental Biology, Toxicology and Disaster Management	36	2	1
5	ZY5B07U	Evolution, Zoogeography and Ethology	54	3	3
5	ZY5B07U [P]	(Practical) Evolution, Zoogeography and Ethology	36	2	1
5	ZY5B08U	Biochemistry, Physiology and Endocrinology	54	3	3
5	ZY5B08U [P]	(Practical) - Biochemistry, Physiology & Endocrinology	36	2	1
6	ZY6B09U	Reproductive and Developmental Biology	54	3	3
6	ZY6B09U[P]	(Practical) - Reproductive and Developmental Biology	36	2	1
6	ZY6B10U	Genetics and Biotechnology	54	3	3

6	ZY6B10U [P]	(Practical) Genetics & Biotechnology	36	2	1
6	ZY6B11U	Microbiology and Immunology	54	3	3
	ZY6B11U [P]	(Practical) – Microbiology and Immunology	36	2	1
6	ZY6B12U	General informatics Bioinformatics and Biostatistics	54	3	3
6	ZY6B12U [P]	(Practical) General Informatics, Bioinformatics and Bio statistics	36	2	1

CORE CHOICE BASED COURSE (6th SEMESTER) Core- Course Electives					
The students of Zoology Programme of each college can select any of the three in consultation with the Faculty of the Department .					
6	ZY6B13U	Ecotourism	72	4	3
6	ZY6B14U	Nutrition, community health and Sanitation	72	4	3
6	ZY6B15U	Economic Zoology	72	4	3
Project 6	ZY6BPVU	Project and Viva (6th Semester)	18	1	1

		Visit to research institutes (6th Semester) Study tour/Field study , Group activity (5th Semester)	18	1	
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ZY2B02U [P] Practical 2

BIODIVERSITY AND MODERN SYSTEMATICS

36 hrs

Credit 1

1. Quadrature study
2. Transect study
3. Sampling
4. Species area curve
5. Identification using keys
 - Insect
 - Fish
 - Snake
6. Taxa, identification techniques
 - Bird body parts
 - Butterfly/ dragonfly body parts and venation
7. Simple identification of any 20 animals (local – represent all taxa)
 - Common name and scientific name
8. Field study (compulsory)
 - Visit to two important areas of biodiversity
 - Report on local biodiversity conservation efforts
 - Eg. Sacred grooves, medicinal plant garden

Report should be submitted by each student

ZY5B06U [P] PRACTICAL 6
ENVIRONMENTAL BIOLOGY, TOXICOLOGY & DISASTER
MANAGEMENT

36 hrs

Credit 1

1. Estimation of dissolved oxygen
2. Estimation of dissolved carbon dioxide
3. Estimation of Soil Organic Carbon(Demonstration only)
4. Plankton count
5. Identification of freshwater/ marine plankton
6. Extraction of soil organisms(Demonstration only)
7. Identification of minerals and rocks
8. Sechi disc, Plankton Net
9. **Compulsory Field Study report on one Terrestrial/Marine/Fresh water ecosystem**

ZY6B10U [P] PRACTICAL 10**GENETICS AND BIOTECHNOLOGY****36 hrs****Credit 1**

1. Genetic problems – (Problems from each type)
 - (a) Mono and Dihybrid ratio (b) Back cross (c) Multiple alleles.
2. Study of barr body in human buccal epithelium.
3. Study through photographs of the Karyotype- Turner's Syndrome , Klinefelters and Down's Syndrome.
4. Study of the karyotype and idiogram from the given photograph of somatic metaphase chromosome-(Human)
5. Sexing of *Drosophila melanogaster*
6. Isolation of DNA (Demonstration)
7. Study of Polymerase Chain Reaction (Demonstration)
8. Western blotting of proteins from SDS-polyacrylamide gel (Demonstration)
9. Southern blotting of DNA fragments from agarose gel (Demonstration)
10. Northern Blotting of RNA molecules (Demonstration)

(Students are expected to visit the near by research institution / Biotechnology departments/ research centre, and see the demonstration of practicals 5, 6 7, and 8,/Video showif they do not have such facility in their institution)

Core Reading

S. Janardhanan and Vincent S.2008 *Practical Biotechnology Methods and protocols* Cambridge University Press.

BRANCH III

M.Sc.

CHEMISTRY

	Code	Course	Hours/ Week	Total Hours	Credit
Semester 1	CH1C01	Organometallics and Nuclear Chemistry	4	72	4
	CH1C02	Structural and Molecular Organic Chemistry	4	72	4
	CH1C03	Quantum Chemistry and Group Theory	4	72	4
	CH1C04	Classical and Statistical Thermodynamics	3	54	3
	CH2P01	Inorganic Chemistry Practical-1	3	54	Evaluation at the end of second semester
	CH2P02	Organic Chemistry Practical-1	3	54	
	CH2P03	Physical Chemistry Practical-1	4	72	
		Total	25	450	15
Semester 2	CH2C05	Coordination Chemistry	4	72	4
	CH2C06	Organic Reaction Mechanisms	4	72	4
	CH2C07	Chemical Bonding and Computational Chemistry	4	72	4
	CH2C08	Molecular Spectroscopy	3	54	3
	CH2P01	Inorganic Chemistry Practical-1	3	54	3
	CH2P02	Organic Chemistry Practical-1	3	54	3
	CH2P03	Physical Chemistry Practical-1	4	72	3
		Total	25	450	24
Semester 3	CH3C09	Structural Inorganic Chemistry	4	72	4
	CH3C10	Organic Syntheses	4	72	4
	CH3C11	Chemical Kinetics, Surface Chemistry and Photochemistry	4	72	4
	CH3C12	Spectroscopic Methods in Chemistry	3	54	3
	CH4P04	Inorganic Chemistry Practical-2	3	54	Evaluation at the end of fourth semester
	CH4P05	Organic Chemistry Practical-2	3	54	
	CH4P06	Physical Chemistry Practical-2	4	72	
		Total	25	450	15
Semester 4		Elective 1	5	90	4
		Elective 2	5	90	4
		Elective 3	5	90	4
	CH4P04	Inorganic Chemistry Practical-2	3	54	3
	CH4P05	Organic Chemistry Practical-2	3	54	3
	CH4P06	Physical Chemistry Practical-2	4	72	3
	CH4D01	Project			3
	CH4V01	Viva			2
	Total	25	450	26	
Grand Total					80

SEM	Name of the course with course code	No.of Hrs/ week	No. of credit	Total Hrs/ SEM.
I	PH1C01: Mathematical Methods in Physics- I	4	4	72
I	PH1C02: Classical Mechanics	4	4	72
I	PH1C03: Electrodynamics	4	4	72
I	PH1C04: Electronics	4	4	72
I	PH1P01: General Physics Practicals	9	3	162
II	PH2C05: MathematicalMethodsInPhysics- II	4	4	72
II	PH2C06: Quantum Mechanics - I	4	4	72
II	PH2C07: Thermodynamics and Statistical Mechanics	4	4	72
II	PH2C08: Condensed Matter Physics	4	4	72
II	PH2P02: Electronics Practicals	9	3	162
III	PH3C09: Quantum Mechanics - II	4	4	72
III	PH3C10: Computational Physics	4	4	72
III	PH3P03: Computational Physics Practicals	9	3	162
IV	PH4C11: Atomic and Molecular Physics	4	4	72
IV	PH4C12: Nuclear and Particle Physics	4	4	72
IV	PH4D05: Project/Dissertation	Nil	2	Nil
IV	PH4V06: Viva Voce	Nil	2	Nil

Table 1.1: Structure of PGCSS Physics M.Sc. Common Courses

M.A. English Language and Literature

SEMESTER ONE		
Specification	Course Code	Course Title
Core	LEN01PC1	Chaucer and the Roots of English
Core	LEN01PC2	Writings of the Renaissance
Core	LEN01PC3	Revolution of the Enlightenment
Core	LEN01PC4	Literary Criticism and Academic Writing
Core	LEN01PC5	Indian English Literature

SEMESTER TWO		
Specification	Course Code	Course Title
Core	LEN02PC6	Literature of the Nineteenth Century
Core	LEN02PC7	Modernism in Context
Core	LEN02PC8	Dimensions of the Postmodern
Core	LEN02PC9	Language and Linguistics
Core	LEN02PC10	Theories of Knowledge

SEMESTER THREE		
Specification	Course Code	Course Title
Core	LEN03PC11	American Literature
Core	LEN03PC12	Cultural Studies
Core	LEN03PC13	Gender Studies
Core	LEN03PC14	Modes of Fiction
Core	LEN03PC15	Texts and Performances

SEMESTER FOUR		
Specification	Course Code	Course Title
Core	LEN04PC16	Literature and the Empire
Elective	LEN04PE01	Modern European Drama
Elective	LEN04PE02	Shakespeare across Cultures
Elective	LEN04PE03	Studying Translations: Aspects and Contexts
Elective	LEN04PE04	The Indian Poetic Tradition
Project	LEN04PP	Project
Project	LEN04VV	Comprehensive Viva

M.A. Economics

Semester I		
Course	Course Code	Course Title
Core	ECOPGS1 01	Microeconomics: Theory Of Consumer Behaviour& Firm
Core	ECOPGS1 02	Macroeconomic Theory And Policy
Core	ECOPGS1 03	Indian Economy: Issues and Policies-I
Core	ECOPGS1 04	Economics of Development and Growth-I
Core	ECOPGS1 05	Quantitative Methods for Economic Analysis- I
Semester II		
Course	Course Code	Course Title
Core	ECOPGS2 06	Microeconomics: Markets, Information And Welfare
Core	ECOPGS2 07	Advanced Macroeconomic Theory And Policy
Core	ECOPGS2 08	Indian Economy: Issues and Policies-II
Core	ECOPGS2 09	Economics Of Development And Growth- II
Core	ECOPGS2 10	Quantitative Methods For Economic Analysis- II
Semester III		
Course	Course Code	Course Title
Core	ECOPGS3 11	International Trade Theory And Policy
Core	ECOPGS3 12	Public Economics
Core	ECOPGS3 13	Research Methods In Economics
Core	ECOPGS3 14	Economics Of Environment And Social Sector
Elective	ECOPGELE1	Monetary Theory And Policy
Semester IV		
Course	Course Code	Course Title
Core	ECOPGS4 15	Global Trading And Monetary System
Core	ECOPGS4 16	Indian Public Finance
Elective	ECOPGELE5	Fundamentals Of Environmental Economics
Elective	ECOPGELE8	Personnel Management
Elective	ECOPGELE11	Economics Of Agriculture
Dissertation	ECOPGS4D	Dissertation Cum Viva
Viva	ECOPGS4V	General Viva

M.Com (Regular & Self – financing)

Sem.	Course Code	Course Title
I	AF01C01	Advanced Financial Accounting - 1
	PM01C02	Principles of Management and Organizational Behaviour
	FM01C03	Financial Management Principles
	RM01C04	Research Methodology
	QT01C05	Quantitative Techniques
II	AF02C06	Advanced Financial Accounting- 2
	SM02C07	Strategic Management
	FM02C08	Financial Management Strategies
	HR02C09	Human Resource Management
	OR02C10	Operations Research
III	MA03C11	Management Accounting
	DT03C12	Direct Tax- Law and Practice
	IB03C13	International Business
	CG03C14	Corporate Governance
	BE03C15	Business Environment
IV	AC04C16	Advanced Cost Accounting
	DT04C17	Direct Tax- Assessment and Procedure
	IF04E01	International Finance
	FM04E02	Financial Markets and Derivatives
	SA04E03	Security Analysis and Portfolio Management
	PD04C18	Dissertation/Project
	VV04C19	Viva voce

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Table of Courses and Credits

COURSE CODE	COURSE TITLE	TEACHING (LECTURE+ PRACTICAL)	TYPE	CREDITS
SEMESTER I		TOTAL CREDITS 19		
ST 050101	STATISTICAL FOUNDATION FOR DATA ANALYTICS	3L+2P	THEORY	3
ST 050102	MATHEMATICAL FOUNDATION FOR DATA ANALYTICS 1	4L+1P	THEORY	3
ST 050103	REGRESSION ANALYSIS	3L+2P	THEORY	3
ST 050104	DATA BASE TECHNOLOGY	3L+2P	THEORY	2
ST 050105	PROGRAMMING AND DATA STRUCTURES WITH PYTHON	2 L+ 3P	THEORY	2
ST 050106	PRACTICAL 1		PRACTICAL *	3
ST 050107	PRACTICAL 2		PRACTICAL *	3
SEMESTER II		TOTAL CREDITS 19		
ST 050201	MATHEMATICAL FOUNDATION FOR DATA ANALYTICS 2	4L+1P	THEORY	3
ST 050202	MULTIVARIATE ANALYSIS	3L+2P	THEORY	3
ST 050203	STOCHASTIC PROCESS AND TIME SERIES ANALYSIS	3L+2P	THEORY	3
ST 050204	DATA VISUALIZATION	3L+2P	THEORY	2
ST 050205	PROGRAMMING USING R	2L + 3P	THEORY	2
ST 050206	PRACTICAL 3		PRACTICAL *	3
ST 050207	PRACTICAL 4		PRACTICAL *	3
SEMESTER III		TOTAL CREDITS 21		
ST 050301	SAMPLING & DESIGN OF EXPERIMENTS	4L+2P	THEORY	3
ST 050302	OPTIMIZATION TECHNIQUES	4L+2P	THEORY	3
ST 050303	MACHINE LEARNING	5L+ 2P	THEORY	3
ST 050304	BIG DATA ANALYTICS AND HADOOP	4L+2P	THEORY	3
ST 050305	INTERNSHIP			3

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ST 050306	PRACTICAL 5		PRACTICAL *	3
ST 050307	PRACTICAL 6		PRACTICAL *	3
	SEMESTER IV TOTAL CREDITS 21			
	ELECTIVE 1	3L + 2 P	THEORY	3
	ELECTIVE 2	3L + 2 P	THEORY	3
	ELECTIVE 3 - PRACTICAL BASED ON ELECTIVES 1 & 2		PRACTICAL *	3
ST 050401	INDUSTRIAL VISIT	5		5
ST 050402	PROJECT	10		5
ST 050403	COMPEHENCIVE VIVA VOCE			2
	GRAND TOTAL OF CREDITS			80

COURSE CODE	LIST OF ELECTIVE COURSES	TEACHING (LECTURE+ PRACTICAL)	TYPE	CREDITS
ELECTIVES – BUNCH 1				
ST 900401	ARTIFICIAL INTELLIGENCE	3L+2P	THEORY	3
ST 900402	EPIDEMIOLOGY AND CLINICAL TRIALS	3L+2P	THEORY	3
ST 900403	DATA SCIENCE PRACTICAL		PRACTICAL *	3
ELECTIVES – BUNCH 2				
ST 910401	CLOUD COMPUTING	3L+2P	THEORY	3
ST 910402	RELIABILITY MODELING AND STATISTICAL QUALITY CONTROL	3L+2P	THEORY	3
ST 910403	DATA ANALYTICS PRACTICAL		PRACTICAL *	3
ELECTIVES – BUNCH 3				
ST 920401	WEB ANALYTICS	3L+2P	THEORY	3
ST 920402	ECONOMETRICS	3L+2P	THEORY	3
ST 920403	DATA MANAGEMENT PRACTICAL		PRACTICAL *	3

* All Practical question papers shall be generated from university