SANT GHIRA GURU VISHWAVIDYALAYA
SARGUJA AMBIKAPUR (C.G.)

CHOICE BASED CREDIT SYSTEM
(CBCS)
2018-19

Syllabus

M.A. ~~Socilogy~~ Sociology

FIRST SEMESTER (CBCS)

PART-1

Course Code	Course Type	Course(Paper /Subjects) Compulsory paper	Credits	Contact Hours Per Week			Exam Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MAS 101	CCC	CLASSICAL SOCIOLOGICAL TRADITION	6	4	3	00	3	0	70	30
MAS102	CCC	SOCIAL ANTHROPOLOGY	6	4	3	00	3	0	70	30
MAS103	CCC	SOCIAL CHANGE IN INDIA	6	4	3	00	3	00	70	30
MAS111	CCC	METHODOLOGY IN SOCIAL RESEACH	6	00	00	06	0	3	70	30
		OPTIONAL PAPER								
MAS02	ECC/CB	GENDER AND SOCIETY	6	4	3	00	3	00	70	30
MASA05	ECC/CB	URBAN SOCIOLOGY	6	4	3	00	3	00	70	30

M.A. SOCIOLOGY SECOND SEMESTER (CBCS)

Course Code	Course Type	Course(Paper /Subjects) Compulsory paper	Credits	Contact Hours Per Week			Exam Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MAS 101	CCC	CLASSICAL SOCIOLOGICAL TRADITION	6	4	3	00	3	0	70	30
MAS102	CCC	SOCIAL ANTHROPOLOGY	6	4	3	00	3	0	70	30
MAS103	CCC	SOCIAL CHANGE ININDIA	6	4	3	00	3	0	70	3
MAS111	CCC	FIELD WORK	6	00	00	08	0	3	100	00
		OPTIONAL PAPER								
MAS02	ECC/CB	GENDER AND SOCIETY	6	4	3	00	3	00	70	00
MAS405	ECC/CB	URBAN SOCIOLOGY	6	4	3	00	3	00	70	00

PART-3

M.A. SOCIOLOGY THIRD SEMESTER (CBCS)

Course Code	Course Type	Course(Paper /Subjects)	Credits	Contact Hours Per Week			Exam Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MAS 301	CCC	CLASSICAL SOCIOLOGICAL THEORY	4	4	3	00	3	0	70	30
MAS 302	CCC	PERSPECTIVE ON INDIAN SOCIETY	4	4	3	00	3	0	70	30
MAS 303	CCC	CRIMINOLOGY - I	4	4	3	00	3	0	70	30
		OPTIONAL PAPER								
MAS 301	OSC	INTELLECTUAL PROPERTY, HUMAN RIGHTS & ENVIRONMENT : BASICS	4	4	3	00	3	0	70	30
MAS301	ECC/CB	TRIBAL STUDIES	4	4	3	00	3	0	70	30
MAS 302	ECC/CB	SOCIAL DEMOGRAPHY	4	4	3	00	3	0	70	30
MAS 303	ECC/CB	SOCIAL MOVEMENTS IN INDIA	4	4	3	00	3	0	70	30

PART-4

M.A. SOCIOLOGY FOURTH SEMESTER (CBCS)

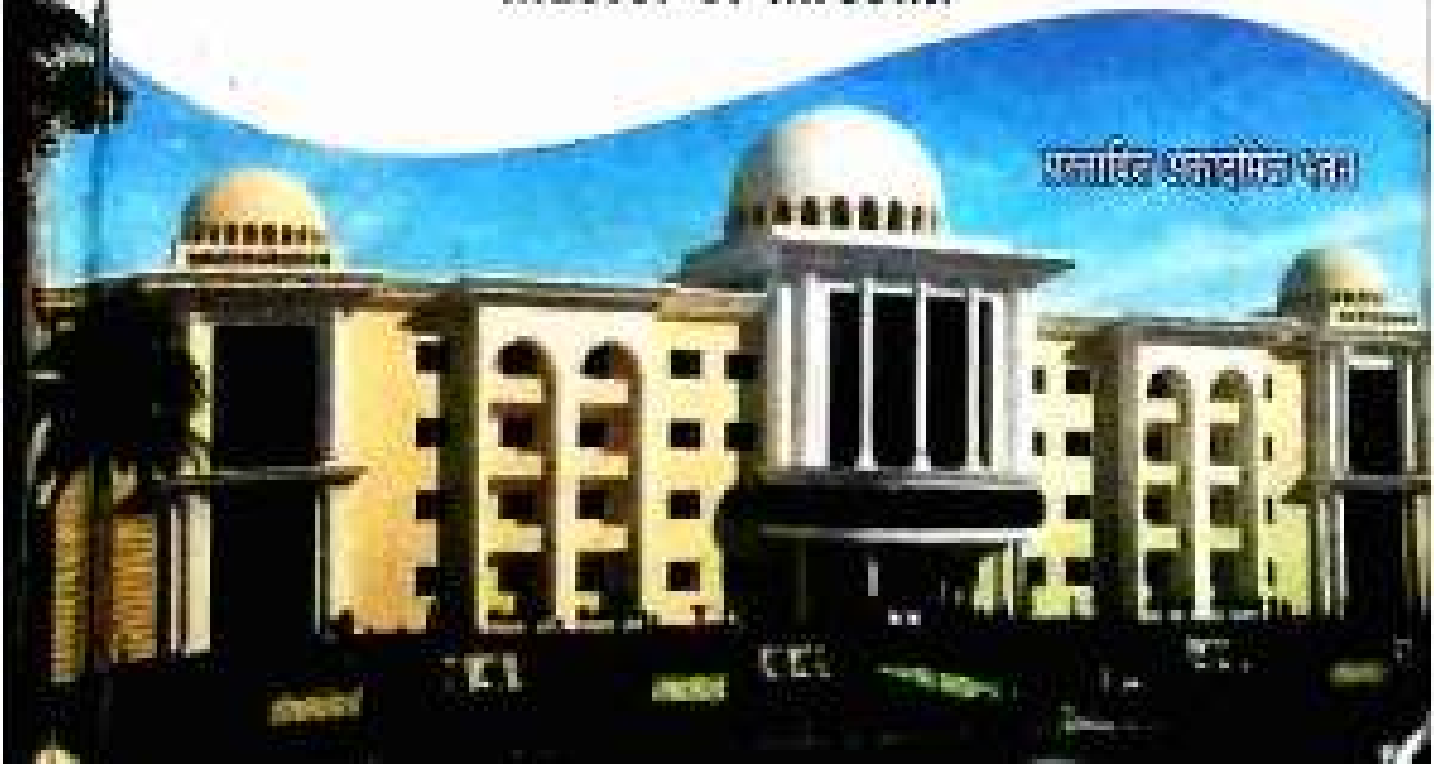
Course Code	Course Type	Course(Paper /Subjects)	Credits	Contact Hours Per Week			Exam Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
		Compulsory paper		L	T	P	Thy	P		
MAS 401	CCC	MODERN SOCIOLOGICAL THEORY	6	4	3	00	3	0	70	30
MAS 402	CCC	COMPARATIVE SOCIOLOGY	6	4	3	00	3	0	70	30
MAS 303	CCC	CRIMINOLOGY-II	6	4	3	00	3	0	70	30
MAS 304	PRJ/SSC	DISSERTATION	6	4	3	00	3	0	70	30
		OPTIONAL PAPER			*					
MAS301	ECC/SS	URBAN SOCIETY IN INDIA	6	4	3	00	3	0	70	30
MAS02	ECC/SS	SOCIOLOGY OF DISASTER MGT. AND DISASTER PLANNING	6	4	3	00	3	0	70	30

SANT GHIRA GURU VISHWAVIDYALAYA
SARGUJA AMBIKAPUR (C.G.)

CHOICE BASED CREDIT SYSTEM
(CBCS)
2018-19

Syllabus

Master of M.Com.



M. COM. FIRST SEMESTER

Course Code	Paper/Subject	Credit	Contract Hour Per Week			EoSE Duration (Hrs.)	
			L	T	P	THY	P
MCM 101	Managerial Economics	6	4	3	0	3	0
MCM 102	Advanced Accounting	6	4	3	0	3	0
MCM 103	Management Accounting	6	4	3	0	3	0
MCM S01-OSC (Compulsory)	Research Methodology & Computer Application Basics	6	4	3	0	3	0
ECC/CB-A01	Constitutionalism & Indian Political System	6	4	3	0	3	0
ECC/CB-A02	Advanced Business Statistics						
ECC/CB-A03	Business Finance						
ECC/CB-A04	Marketing Management						
ECC/CB-A05	Principle of Marketing						
MINIMUM CREDIT IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30		30					

M. COM. SECOND SEMESTER

Course Code	Paper/Subject	Credit	Contract Hour Per			EoSE (Hrs)	
			L	T	P	THY	P
MCM 201	Business Economics	6	4	3	0	3	0
MCM 202	Specialized Accounting	6	4	3	0	3	0
MCM 203	Accounting for Managerial Decision	6	4	3	0	3	0
MCM 502-OSC (Compulsory)	Social Outreach & Skill Development	6	4	3	0	3	0
ECC/CB-B01	Environment & Forest Law	6	4	3	0	3	0
ECC/CB-B02	Advanced Statistics						
ECC/CB-B03	Business Law						
ECC/CB-B04	Marketing Strategy						
ECC/CB-B05	Advertising & Sales Management						
ECC/CB-B06	Personnel Management						
MINIMUM CREDIT IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30		30					

M. COM. THIRD SEMESTER

Course Code	Paper/Subject	Credit	Contract Hour Per			BoSE (Hrs.)	
			L	T	P	THY	P
MCM 301	Management Concept	6	4	3	0	3	0
MCM 302	Organization Behaviour	6	4	3	0	3	0
MCM 303	Advanced Cost Accounting	6	4	3	0	3	0
MCMS03-OSC (Compulsory)	Intellectual Properties, Human Rights & Environment Basics	6	4	3	0	3	0
ECC- 001	Tribal Studies	6	4	3	0	3	0
ECC - 002	Strategic Management						
ECC - 003	International Marketing						
ECC - 004	Production Management						
ECC - 005	Life Insurance						
ECC - 006	Accounting Methods						
MINIMUM CREDIT IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30		30					

M. COM. FORTH SEMESTER

Course Code	Paper/Subject	Credit	Contract Hour Per			EoSE (Hrs.)	
			L	T	P	THY	P
MCM 401	Corporate Legal Framework	6	4	3	0	3	0
MCM 402	Marketing Research	6	4	3	0	3	0
MCM 403	Investment Management	6	4	3	0	3	0
MCMS04-OSC (Compulsory)	Dissertation	6	4	3	0	3	0
ECC –D01	Consumer Behavior	6	4	3	0	3	0
ECC- D02	Financial Institution and Markets						
ECC - D03	Goods & Service Taxes - GST						
ECC - D04	Industrial Law						
ECC - D05	Bank Management						
ECC - D06	Introduction to Information Technology						
MINIMUM CREDIT IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30		30					

NT GHIRA GURU VISHWAVIDYALAYA
SARGUJA AMBIKAPUR (C.G.)

CHOICE BASED CREDIT SYSTEM
(CBCS)
2018-19

Syllabus

M.Sc.Chemistry

M.Sc. CHEMISTRY FIRST SEMESTER

First Semester (CBCS)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per WeeK			EoSE Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MSC 101	CCC	INORGANICCHEMISTRY-1	6	4	3	0	3	0	80	20
MSC 102	CCC	ORGANICCHEMISTRY-1	6	4	3	0	3	0	80	20
MSC 103	CCC	ANALYTICAL CHEMISTRY	6	4	3	0	3	0	80	20
MSC 111	CCC	INORGANIC AND ANALYTICAL CHEMISTRY-1 LAB	6	0	0	9	0		100	
MSC 501	OSC	RESEARCH METHODOLOGY & COMPUTER APPLICATION: BASICS	6	4	3	0	3	0	80	20
MSC A01	ECC/CB	CONSTITUTIONALISM & INDIAN POLITICAL SYSTEM	6	4	3	0	3	0	80	20
MSC A02	ECC/CB	GROUP THEORY, SPECTROSCOPY AND DIFFRACTION METHODS								
MSC A03	ECC/CB	COMPUTER PROGRAMMING IN CHEMISTRY								
MSC A04	ECC/CB	MEDICINAL CHEMISTRY								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			Total Credit= 36							

Second Semester (CBCS)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per WeeK			EoSE Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MSC 201	CCC	INORGANICCHEMISTRY-2	6	4	3	0	3	0	80	20
MSC 202	CCC	ORGANICCHEMISTRY-2	6	4	3	0	3	0	80	20
MSc 203	CCC	PHYSICALCHEMISTRY	6	4	3	0	3	0	80	20
MSC 211	CCC	ORGANIC AND PHYSICALCHEMISTRYLAB	6	0	0	9	0		100	
MSC S02	PRJ/SSC	SOCIAL OUTREACH AND SKIL DEVELOPMENT	6	4	3	0	3	0	80	20
MSC B01	ECC/CB	ENVIRONMENTAL AND FOREST LAWS	6	4	3	0	3	0	80	20
MSC B02	ECC/CB	POLYMER CHEMISTRY								
MSC B03	ECC/CB	ORGANIC SYNTHESIS-1								
MSC B04	ECC/CB	APPLIED CHEMISTRY								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			Total Credits 36							

Third Semester (CBCS)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			ExSE Duration (Hrs.)		Marks	
				L	T	P	Dy	P	SEE	IA
MSC 301	CCC	APPLICATIONS OF SPECTROSCOPY-INORGANIC CHEMISTRY	6	4	3	0	3	0	80	20
MSC 302	CCC	APPLICATIONS OF SPECTROSCOPY-ORGANIC CHEMISTRY	6	4	3	0	3	0	80	20
MSC 303	CCC	PHOTOCHEMISTRY AND PERICYCLIC REACTION	6	4	3	0	3	0	80	20
MSC 311	CCC	ORGANIC CHEMISTRY LAB	6	0	0	9	0		100	
MSC 380	OEC	INTELLECTUAL PROPERTY, HUMAN RIGHTS & ENVIRONMENT: BASICS	6	4	3	0	3	0	80	20
MSC CH1	ECCCH	TRIBAL STUDIES	6	4	3	0	3	0	80	20
MSc CH2	ECCCH	GREEN CHEMISTRY								
MSC CH3	ECCCH	ORGANIC SYNTHESIS II								
MSC CH4	ECCCH	HETEROCYCLIC CHEMISTRY								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			Total Credits 30							

Fourth Semester (CBCS)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			ExSE Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MSC 401	CCC	BIOINORGANIC CHEMISTRY	6	4	3	0	3	0	80	20
MSC 402	CCC	ENVIRONMENTAL CHEMISTRY	6	4	3	0	3	0	80	20
MSC 403	CCC	SOLID STATE CHEMISTRY	6	4	3	0	3	0	80	20
MSC 411	CCC	GENERAL CHEMISTRY LAB	6	0	0	9	3	0	100	
MSC 504	PRJ/SSC	DISSERTATION	6	4	3	0	3	0	80	20
MSC D01	ECC/CB	PHOTOINORGANIC CHEMISTRY	6	4	3	0	3	0	80	20
MSC D02	ECC/CB	MATERIAL SCIENCE								
MSC D03	ECC/CB	CHEMISTRY OF NATURAL PRODUCT								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			Total Credit = 36							

SANT GHIRA GURU VISHWAVIDYALAYA
SARGUJA AMBIKAPUR (C.G.)

CHOICE BASED CREDIT SYSTEM
(CBCS)
2018-19

Syllabus

M.A.History

M.A. HISTORY

First Semester (CBCS)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			ESE Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MAH 101	CCC	CONCEPT OF HISTORY	6	4	3	0	3	0	70	30
MAH 102	CCC	MODERN WORLD	6	4	3	0	3	0	70	30
MAH 103	CCC	ANCIENT AND MEDIEVAL CHHATTISGARH	6	4	3	0	3	0	70	30
MAH 501	OSC	RESEARCH METHODOLOGY AND COMPUTER APPLICATION: BASICS	6	4	3	0	3	0	70	30
MAH A01	BCC/ CB	HISTORY OF GREAT BRITAIN 1815-1885 AD	6	4	3	0	3	0	70	30
MAH A02	BCC/ CB	HISTORY OF CHINA & JAPAN 1800-1911 AD								
MAH A03	BCC/ CB	WOMEN IN INDIAN HISTORY IN ANCIENT & MEDIEVAL PERIOD								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			30							

M.A. HISTORY
Second Semester (CBCS)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			ESE Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	
MAH 201	CCC	HISTORIOGRAHY	6	4	3	0	3	0	70	3
MAH 202	CCC	CONTEMPORARY WORLD	6	4	3	0	3	0	70	3
MAH 203	CCC	MODERN CHHATTISGARH	6	4	3	0	3	0	70	3
MAH - 802	OSC	SOCIAL OUTREACH AND SKILL DEVELOPMENT	6	4	3	0	3	0	70	3
MAH 801	ECC/ CB	MODERN ENGLAND 1885-1966 AD	6	4	3	0	3	0	70	30
MAH 802	ECC/ CB	HISTORY OF CHINA & JAPAN 1911-1950 AD								
MAH 803	ECC/ CB	WOMEN IN INDIAN HISTORY IN MODERN PERIOD								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			30							

M.A. HISTORY
Third Semester (CBCS)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per WeeK			EoSE Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MAH 301	CCC	HISTORY OF NATIONAL MOVEMENT (1857 AD - 1922AD)	6	4	3	0	3	0	70	30
MAH 302	CCC	ANCIENT INDIA – 2500 BC TO 1000 AD	6	4	3	0	3	0	70	30
MAH 303	CCC	INDIAN POLITY AND ECONOMY IN SULTANATE PERIOD (1200-1526 A.D.)	6	4	3	0	3	0	70	30
MAH 503	OEC	INTELLECTUAL PROPERTY, HUMAN RIGHTS & ENVIRONMENT: BASICS	6	4	3	0	3	0	70	30
MAH C01	ECC/ CB	Cultural History of India	6	4	3	0	3	0	70	30
MAH C02	ECC/ CB	History of Science and Technology in India								
MAH C03	ECC/ CB	Thinkers of Modern India (1920 to 2000 AD)								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			30							

M.A. HISTORY
Fourth Semester (CBCS)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			EoSE Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MAH 401	CCC	HISTORY OF NATIONAL MOVEMENT (1922 to 1947 A.D.)	6	4	3	0	3	0	70	30
MAH 402	CCC	Indian Polity and Economy in Mughal Period	6	4	3	0	3	0	70	30
MAH 403	CCC	Modern India 1858 A.D. to 1964 A.D. (Political, Administrative)	6	4	3	0	3	0	70	30
MAH 404	OSC	DISSERTATION	6	4	3	0	3	0	70	30
MAH D01	ECC /CB	Gandhism Theory and Practice	6	4	3	0	3	0	70	30
MAH D02	ECC /CB	The Evolution of Human Rights in the 20th Century								
MAH D03	ECC /CB	Tourism Theory and Principles In Reference of History								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			30							

SANT GHIRA GURU VISHWAVIDYALAYA
SARGUJA AMBIKAPUR (C.G.)

CHOICE BASED CREDIT SYSTEM
(CBCS)
2018-19

Syllabus

M.A.Political Science

Syllabus of M.A. (Political Science) for Regular Mode (CBCS Pattern-2018)

M.A. (Political science) FIRST SEMESTER

Eligibility criteria	Admission Criteria	Course code	Course Type	Name of Papers	Credits	Teaching Hours Per Week	
						Lecture	Tutorial
Bachelor Degree in Concerned Subjects and According to UGC Higher Education Guideline	1. Merit List 2. Entrance Test (written cum oral) 3. Observation of Reservation Policy	MAP 101	CCC	DEBATES IN POLITICAL THEORY	6	4	2
		MAP 102	CCC	COMPARATIVE POLITICAL ANALYSIS	6	4	2
		MAP 103	CCC	INDIAN GOVERNMENT AND POLITICS	6	4	2
		MAP 501	DSC	RESEARCH METHODOLOGY & COMPUTER APPLICATION: BASICS	6	4	2
		MAP A01	DCC/CB	THEORIES OF INTERNATIONAL RELATIONS	6	4	2
		MAP A02	DCC/CB	INTERPRETING MODERN INDIA			
		MAP A03	DCC/CB	CONTEMPORARY DEBATES IN POLITICAL THEORY			
				Total	30		

Syllabus of M.A. (Political science) for Regular Mode (CBCS Pattern-2018)

M.A. (Political science) SECOND SEMESTER

Eligibility criteria for Qualifying Exam	Course code	Course Type	Name of Papers	Credits	Teaching Hours for Week	
					Lecture	Tutorial
After appearing in the first semester examination irrespective of any number of back/ arrear papers	MAP 201	CCC	ADMINISTRATIVE THEORY: PRINCIPLES AND APPROACHES	4	4	1
	MAP 202	CCC	THEMES IN INDIAN POLITICAL THOUGHT	4	4	1
	MAP 203	CCC	WESTERN POLITICAL THOUGHT	4	4	1
	MAP 221	PROFESSIONAL	SOCIAL HISTORY AND REEL DEVELOPMENT	4	3	1
	MAP 222	ECCCH	ETHICS AND POLITICS	4	4	1
	MAP 223	ECCCH	CRITICAL EXAMINATION OF POLITICAL THEORY			
	MAP 224	ECCCH	SOCIAL MOVEMENTS AND REVOLUTIONS			
			Total	20		

Syllabus of M.A. (Political science) for Regular Mode (CBCS Pattern-2018)

M.A. (Political science) THIRD SEMESTER

Eligible criteria Qualifying Exam	Course code	Course Type	Name of Papers	Credits	Teaching Hours Per Week	
					Lecture	Tutorial
After appearing in the second semester examination irrespective of any number of back/ arrear paper	MAP 301	CCC	DEMOCRACY AND POLITICAL INSTITUTIONS IN INDIA	6	4	2
	MAP 302	CCC	PARTIES, ELECTIONS AND POLITICAL PROCESS IN INDIA	5	4	2
	MAP 303	CCC	INDIAN POLITICAL THOUGHT	6	4	2
	MAP 304	OSC	INTELLECTUAL PROPERTY RIGHTS, HUMAN RIGHTS & ENVIRONMENT: BASICS	5	4	2
	MAP C01	ECC/CB	TRIBAL STUDIES	6	4	2
	MAP C02	ECC/CB	DEMOCRACY AND HUMAN RIGHTS IN INDIA			
	MAP C03	ECC/CB	ADMINISTRATIVE THEORY			
			Total	28		

Syllabus of M.A. (Political science) for Regular Mode (CBCS Pattern-2018)

M.A. (Political science) FOURTH SEMESTER

Eligibility criteria /Qualifying Exam)	Course code	Course Type	Name of Paper	Credits	Teaching Hours Per Week	
					Lecture	Tutorial
After appearing in the third semester examination, irrespective of any number of backs/ over papers	MAP 401	CCC	PRINCIPLES OF INTERNATIONAL POLITICS	4	4	1
	MAP 402	CCC	INDIA AND THE WORLD	4	4	1
	MAP 403	CCC	POLITICAL HISTORY OF CHHATTISGARH	4	4	1
	MAP 421	SEC/PRJ	DISSERTATION*	4	4	1
	MAP 441	ECC/DCE	FOREIGN POLICY OF MAJOR POWERS	4	4	1
	MAP 442	ECC/DCE	DEVELOPMENT PROCESS AND POLITICS IN INDIA			
	MAP 443	ECC/DCE	INTERNATIONAL SECURITY			
			TOTAL	20		

SHRI GURU VISHWAVIDYALAYA
SARGUJA AMBIKAPUR (C.G.)

CHOICE BASED CREDIT SYSTEM
(CBCS)
2018-19

Syllabus

Master of M.A. HINDI

B.A. in HINDI

FACULTY OF ARTS

FIRST SEMESTER (ODD SEMESTER)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			EoSE Duration (Hrs)	
				L	T	P	Th	P
HND [illegible]	CCC	हिंदी साहित्य का इतिहास	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HND [illegible]	CCC	प्राचीन एवं मध्यकालीन काव्य	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HND [illegible]	CCC	हिंदी भाषा एवं भाषा विज्ञान	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HND [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HND [illegible]	ECC(A)	[illegible]						
HND [illegible]	ECC(A)	[illegible]						
HND [illegible]	ECC(A)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HND [illegible]	ECC(A)	[illegible]						
HND [illegible]	ECC(A)	[illegible]						
HND [illegible]	ECC(A)	[illegible]						
[illegible] MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS [illegible] AND IN COMPLETE SEMESTER IT WOULD BE [illegible]			TOTAL - [illegible]					

DEPARTMENT OF HINDI

- M. A. in HINDI :

  FACULTY OF ARTS

- SECOND SEMESTER (EVEN SEMESTER)

Eligibility Criteria (Qualifying Exams)	Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			Exam Duration (Hrs.)	
					L	T	P	Thy	P
After appearing in the Final semester examination irrespective of any number of back/ arrear papers	HND 201	GDC	आधुनिक काव्य	06	4	2	00	3	00
	HND 202	GDC	कथा साहित्य	06	4	2	00	3	00
	HND 203	GDC	भारतीय काव्य शास्त्र	06	4	2	00	3	00
	HND 501	OSC	सामाजिक आंदोलन और सोशल विकास	06	4	2	00	3	00
	HNDS 01	ECDCB	भारतीय राजनीतिक व्यवस्था एवं संविधानिकता	06	4	2	00	3	00
	HNDS 02	ECDCB	आदिकाव्य						
	HNDS 03	ECDCB	संत काव्य						
	HNDS 04	ECDCB	रीति काव्य						
	HNDS 05	ECDCB	छायावाद काव्य						
	HNDS 06	ECDCB	स्वातंत्र्योत्तर हिंदी काव्य						
	MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			TOTAL= 30					

DEPARTMENT OF HINDI

- M. A. in HINDI

FACULTY OF ARTS

- THIRD SEMESTER (HND-SEMESTER)

Eligibility Criteria (Qualifying Papers)	Course Code	Course Type	Course Paper/Subject	Credits	Contact Hours Per Week			EoSE Duration (Hrs.)	
					L	T	P	Thy	P
[illegible]	HND 301	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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DEPARTMENT OF HINDI

- M.A. in HINDI

FACULTY OF ARTS

- FOURTH SEMESTER (EVEN SEMESTER)

Eligibility Criteria (Qualifying Exams)	Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			EoSE Duration (Hrs.)	
					L	T	P	Thy	P
After appearing in the Third semester examination irrespective of any number of backlog answer papers	HND 401	CCC	भारतीय साहित्य ✓	06	4	3	00	3	00
	HND 402	CCC	हिन्दी पत्रकारिता	06	4	3	00	3	00
	HND 403	CCC	प्रयोजनमूलक हिंदी ✓	06	4	3	00	3	00
	HND 421	SSC	लघु शोध प्रबंध	06	00	00	9	00	4
			प्रायोगिक एवं मौखिकी	06	4	3	03	3	00
	HNDO 02	ECCOC	भारतीय मूल्यपरक चिंतन						
	HNDO 03	ECCOC	अनुवाद विज्ञान						
	HNDO 04	ECCOC	कोश विज्ञान						
	HNDO 05	ECCOC	पाठालोचन						
	HNDO 06	ECCOC	भाषा शिक्षण						
	MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			TOTAL 30					

DEPARTMENT OF PHYSICS

- **M.Sc. in PHYSICS** **FACULTY OF SCIENCE**
- **THIRD SEMESTER** (ODD SEMESTER)

Eligibility Criteria Qualifying Exams	Course Code	Course Type	Course/ Paper Title(s)	Credits	Contact Hours Per Week			EoSE Duration (Hrs.)	
					L	T	P	Thy	P
[illegible]	MSP 3[illegible]	[illegible]	Solid State Physics	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MSP 3[illegible]	[illegible]	Solid State Lab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MSP 3[illegible]	[illegible]	Nuclear And Particle Physics	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MSP 3[illegible]	[illegible]	Nuclear Lab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MSP 3[illegible]	[illegible]	[illegible] Dynamics	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MSP 3[illegible]	[illegible]	Intellectual Property, Human Rights Environment Basics	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MSP 3[illegible]	[illegible]	[illegible] Studies	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	MSP 3[illegible]	[illegible]	[illegible] Electronics						
	MSP 3[illegible]	[illegible]	Space Science						
	MSP 3[illegible]	[illegible]	High Energy Physics-II						
				TOTAL [illegible]					

M.Sc. in PHYSICS (THIRD SEMESTER)			
COURSE CODE: MSP 301		COURSE TYPE : CCC	
COURSE TITLE: SOLID STATE PHYSICS			
CREDIT: 08 THEORY: 06 PRACTICAL: 02		HOURS: 135 THEORY: 90 PRACTICAL: 45	
MARKS: 100 THEORY: 70	CCA : 30	PRACTICAL: 50	

OBJECTIVE: The main objective is to learn about solid state physics.

UNIT-1 20 Hrs	Crystal Physics Types of lattices - Miller indices - simple crystal structures - Crystal diffraction - Bragg's law - Reciprocal lattice (sc, bcc, fcc) - Laue equations - Structure factor - Atomic form factor - Types of crystal binding - Cohesive energy of ionic crystals - Madelung constant - Inert gas crystals - Vander Waal - London equation - Metal crystals - Hydrogen bonded crystals.
UNIT-2 15 Hrs	Lattice dynamics Monoatomic lattices - Lattice with two atoms per primitive cell - First Brillouin zone - Group and phase velocities - Quantization of lattice vibrations - Phonon momentum - Inelastic scattering by phonons - Debye's theory of lattice heat capacity - Einstein's model and Debye's model of specific heat - thermal expansion - Thermal conductivity - Umklapp processes.
UNIT-3 20 Hrs	Theory of metals and semiconductors Free electrons gas in three dimensions - Electronic heat capacity - Wiedmann-Franz law - Hall effect - Band theory of metals and semiconductors - Bloch theorem - Kronig-Penny model - Semiconductors - Intrinsic carrier concentration - Mobility - Impurity conductivity - Fermi surfaces and construction - Experimental methods in Fermi surface studies - de Haas Van Alphen effect.

UNIT – 4 (18Hrs)	**Magnetism** Elementary ideas of dia, para and ferro magnetism - quantum theory of paramagnetism - Rare earth ion - Hunds rule – Quenching of orbital angular momentum - Adiabatic demagnetization - Quantum theory of ferromagnetism - Curie point - Exchange integral - Heisenberg's interpretation of Weiss field - ferromagnetic domains - Bloch Wall - Spin waves - Quantization - Magnons - Thermal excitation of magnons - Curie temperature and susceptibility of ferromagnets - Theory of antiferromagnetism - Neel temperature.
UNIT – 5 (20Hrs)	Super conductivity Experimental facts-occurrence - Effect of magnetic fields - Meissner effect - Entropy and heat capacity - Energy gap - Microwave and infrared properties - Type I and II superconductors - theoretical explanation - thermodynamics of super conducting transition - London equation - Coherence length - BCS Theory - single periode Tunneling - Josephson tunneling - DC and AC Josephson effects - High temperature super conductors - SQUIDS.
LABORATORY WORK (45Hrs)	**CORE PRACTICAL III** **SOLID STATE PHYSICS LAB** 1. To study temperature variation of resistivity for a semi conductor and to obtain band gap using four probe method. 2. To study hall effect and to determine hall coefficient. 3. To study the variation of rigidity of a given specimen as a function of the temperature. 4.To Study the Variation of magnetoresistance of a sample with the applied Magnetic Field 5. To Determine the phase diagram of alloys using cooling curve. 6. Indexing of a given XRD pattern and determination of lattice parameter. 7. To determine the wavelength using Michelson Interferometer. 8.Structure Factor calculation of Simple Crystal Structures. 9. Thermoluminescence Studies of Alkali Halides by X-Ray Radiations. 10. Size Estimation of Nano Crystals.

SUGGESTED READINGS

1. N.W. Aschroft and N.D.Mermin, Solid State Physics, Rinehart and Winston, New York.

2. J.S. Blakemore, 1974, Solid State Physics, 2nd Edition, W.B. Saunder, Philadelphia.

3. A.J. Dekker, Solid State Physics, Macmillan India, New Delhi.

4. H.M. Rosenberg, 1993, The Solid State, 3rd Edition, Oxford University Press, Oxford.

5. S.O. Pillai, 1994, Problems and Solutions in Solid State Physics, New Age International, New Delhi.

6. S.L. Altmann, Band Theory of Metals, Pergamon, Oxford.

7. M.A. Wahab, 1999, Solid State Physics, Structure and Properties of Materials, Narosa, New Delhi.

8. J.M. Ziman, 1971, Principles of the Theory of Solids, Cambridge University Press, London.

M.Sc. in PHYSICS (THIRD SEMESTER)		
COURSE CODE: MSP 302	COURSE TYPE : CCC	
COURSE TITLE: NUCLEAR AND PARTICLE PHYSICS		
CREDIT: 08		HOURS: 135
THEORY: 06	PRACTICAL: 02	THEORY: 90 PRACTICAL: 45
MARKS: 100		
THEORY: 70	CCA : 30	PRACTICAL: 50
OBJECTIVE: The main objective is to learn nuclear and particle physics .		

UNIT-1 20 Hrs	**Nuclear Structure And Models** Magnetic dipole moment - Experimental determination - Electric quadruple moment - Liquid drop model - Semi-empirical mass formula of Weizsacker - Nuclear stability - Mass parabolas - Bohr-Wheeler theory of fission - Shell model - Spin-orbit coupling - Magic numbers - Angular moments and parities of nuclear ground state - qualitative discussion and estimates of transition rates - Magnetic moments and Schmidt lines - Collective model of Bohr and Mottelson - Nilsson Model - oblate and prolate deformations of Nucleus.
UNIT-2 15 Hrs	**Nuclear Interactions** Nuclear forces - Two body problem - Ground state of deuteron - Magnetic moment - Quadruple moment - Tensor forces - Meson theory of nuclear forces - Yukawa potential - Nucleon-nucleon scattering - Low energy n-p scattering - Effective range theory - Spin dependence, charge independence and charge symmetry of nuclear forces - Isospin formalism.
UNIT-3 20 Hrs	**Nuclear reactions** Types of reactions and conservation laws - Energetics of nuclear reactions - Reaction dynamics - Q-value equation - Scattering and reaction cross sections - compound nucleus - Scattering matrix - Reciprocity theorem - Breit-Wigner one level formula - Resonance Scattering - Continuum theory - Optical model - Absorption cross section at high energies.
UNIT-4 20 Hrs	**Nuclear decay** Beta decay - Fermi's theory - Fermi-Kurie Plot - Fermi and Gamow - Teller selection rules - Allowed and forbidden decays - Decay rates - Theory of Neutrino - Helicity of neutrino - Helicity measurement - Theory of electron capture - Non-conservation of parity - Gamma decay - Internal conversion - Multipole transitions in nuclei - Nuclear isomerism - Angular correlation in successive gamma emission.
UNIT-5 15 Hrs	**Particle Physics** Types of interactions between elementary particles - Hadrons and Leptons - Symmetry and conservation laws. Elementary ideas of CP and CPT invariance - Classification of Hadrons - Lie algebra - SU (2) - SU (3) multiplets - Quark model - Gell-mann-Okubo mass formula for octet and decuplet Hadrons - Weak interactions.

LABORATORY WORK 18PH12

CORE PRACTICAL IV :NUCLEAR PHYSICS LAB

1. To determine half life of a radio isotope using GM counter.
2. To study absorption of particles and determine range using at least two sources.
3. To study characteristics of a GM counter and to study statistical nature of radioactive decay.
4. To study spectrum of beta- particles using Gamma ray spectrometer.
5. To calibrate a scintillation spectrometer and determine energy of g-rays from an unknown source.
6. To study Compton scattering of gamma rays and verify the energy shift formula.
7.Study of Rutherford Scattering.
8.Positron annihilation.
9. Study of Beer's Law.
10. Stefan's Constant of Radiation – High Resistance by Leakage Method.

SUGGESTED READINGS

1. Y.R. Waghmare, 1981, Introductory Nuclear Physics, Oxford-IBH, New Delhi.

2. Ghoshal , Atomic and Nuclear Physics, Volume 2

3. J.M. Longo, 1971, Elementary Particles, McGraw-Hill, New York.

4. R.D. Evans, 1955, Atomic Nucleus, McGraw-Hill, New York.

5. D.L. Cohen, 1971, Concepts of Nuclear Physics, TMH, New Delhi.

6. M.K. Pal, 1962, Theory of Nuclear Structure, Affi. East-West, Chennai.

7. W.E. Burcham and M. Jobes, 1995, Nuclear and Particle Physics, Addison-Wesley, Tokyo.

M.Sc. in PHYSICS (THIRD SEMESTER)			
COURSE CODE:	MSP 303	COURSE TYPE :	CCC
COURSE TITLE:	CLASSICAL ELECTRODYNAMICS		
CREDIT: 06 THEORY: 06		HOURS: 90 THEORY: 90	
MARKS: 100 THEORY: 70	CCA : 30		

OBJECTIVE: The main objective is to learn classical electrodynamics

UNIT-1 15 Hrs	Electrostatics: Electric field Gauss Law, Differential form of Gaussian law. Another equation of electrostatics and the scalar potential, surface distribution of charges and dipoles and discontinuities in the electric field and potential, Poisson and Laplace equations, Green's Theorem. Uniqueness of the solution with the Dirichlet or Neumann boundary Conditions, Formal Solutions of electrostatic Boundary value problem with Green's function. Electrostatic potential energy and energy density, capacitance.
UNIT-2 25 Hrs	Boundary Value Problems in Electrostatics: Methods of images. Point charge in the presence of a grounded conducting sphere, point charge in the presence of a charged insulated conducting sphere, point charge near a conducting sphere at a fixed potential conducting sphere in a uniform electric field by method of images, Green function for the sphere. General solution for the potential, conducting sphere wit hemispheres at a different potentials, orthogonal functions and expansion.
UNIT-3 20 Hrs	Magnetostatics: Introduction and definition, Biot and Savart Law, the differential equations of magnetostatics and Ampere's law, Vector potential and magnetic induction for a current loop, Magnetic fields of a localized current distribution, Magnetic moment, Force and torque on and energy of a localized current distribution in an external induction, Macroscopic equations, Boundary conditions on B and H Methods of solving Boundary value Problems in magnetostatics, Uniformly magnetized sphere, magnetized sphere in an external fields, permanent magnets, magnetic shielding, spherical shell of permeable material in an uniform field
UNIT-4 30Hrs	Time varying fields, Maxwell's equations conservation laws, Energy in a magnetic field, vector and scalar potentials, Gauge transformations, Lorentz gauge, Coulomb gauge Green function for the wave equation, Derivation of the equations of Macroscopic Electromagnetism.

UNIT-VIII 12hrs	Poynting's Theorem and conservation of energy and momentum for a system of charged particles and EM fields. Conservation laws for macroscopic media. Electromagnetic field tensor, transformation of four potentials and four currents, tensor dissipation of Maxwell's equations.
SUGGESTED READINGS	1. J.D. Jackson: Classical Electrodynamics 2. Panofsky & Philip: Classical electrodynamics and magnetism 3. Griffith: Introduction to Electrodynamics 4. Landau & Lifshitz: Classical Theory of Electrodynamics 5. Landau & Lifshitz: Electrodynamics of continuous media

M.Sc. in PHYSICS (THIRD SEMESTER)	
COURSE CODE: MSPS02	COURSE TYPE : DSC

COURSE TITLE:INTELLECTUAL PROPERTY RIGHTS, HUMAN RIGHTS & ENVIRONMENT: BASICS

CREDIT: 06	HOURS : 90
THEORY: 06	THEORY: 90

MARKS : 100
THEORY: 70 CCA : 30

OBJECTIVE:

- Understands the concept and place of research in concerned subject
- Gets acquainted with various resources for research
- Becomes familiar with various tools of research
- Gets conversant with sampling techniques, methods of research and techniques of analysis of data.

UNIT - I (12Hrs)	• Patents :- Introduction & concepts, Historical Overview. • Subject matter of patent. • Kinds of Patents. • Development of Law of Patents through International treaties and conventions including TRIPS Agreement. • Procedure for grant of patents & term of Patent. • Surrender, revocation and revocation of patent. • Rights and obligations of Patentee. • Grant of compulsory licenses. • Infringement of Patent and legal remedies. • Offences and penalties. • Discussion on leading cases.
UNIT - II (15Hrs)	• Meaning of Copyright, Historical Evolution. • Subject matter of copyright. • Literary works. • Dramatic Works & Musical Works. • Computer Programs. • Cinematographic films. • Registration of Copyrights. • Term of Copyright and Ownership of Copyrights. • Neighbouring Rights. • Rights of Performers & Broadcasters. • Assignment of Copyright. • Author's Special Rights (Moral Rights). • Infringement of Copyrights and defenses. • Remedies against infringement, Jurisdiction of Courts and penalties. • International Conventions including TRIPS Agreement, WIPO, WCT, Paris Union, Berne Convention, UNESCO. • Discussion on leading cases.
UNIT - III (13Hrs)	• Rights: Meaning. • Human Rights: Meaning & Essentials. • Human Rights Kinds. • Rights related to Life, Liberty, Equality & Dignity.

UNIT – 4 24 Hr	▪ National Human Rights Commission ▪ State Human Rights Commission ▪ High Court ▪ Regional Court ▪ *Procedure & Function of High & Regional Court*
UNIT – 5 20 Hr	▪ Right to Environment as Human Right ▪ International Humanitarian Law and Environment ▪ Environment and Conflict Management ▪ Nature and Origin of International Environmental Organizations (IEOs) ▪ Introduction to Sustainable Development and Environment ▪ Sustainable Development and Environmental Governance
SUGGESTED READINGS	1. G.B.Reddy, *Intellectual Property Rights and Law*, Gogia Law Agency, Hyderabad. 2. S.R.Myneni, *Intellectual Property Law*, Eastern Law House, Calcutta 3. P. Narayanan *Intellectual Property Rights and Law* (1999), Eastern Law House, Calcutta, India 4. Vikas Vashishtha *Law and Practice of Intellectual Property* (1999) Bharat Law House, New Delhi. 5. Cornish W.R *Intellectual Property* 3rd ed. (1999), Sweet and Maxwell 6. P.S. Sangal and Kishor Singh, *Indian Patent System and Paris Convention*. 7. Cornish W.R *Intellectual Property, Patents, Copyrights and Allied Rights* (2003). 8. Bibeck Debroy, *Intellectual Property Rights* (1998), Rajiv Gandhi Foundation.

M.Sc. in PHYSICS
(THIRD SEMESTER)

COURSE CODE: MSPETH COURSE TYPE : ELECTIVE

COURSE TITLE: TRIBAL STUDIES

CREDIT: 06	HOURS : 90
THEORY: 06	THEORY: 90

MARKS : 100
THEORY: 70 CCA : 30

OBJECTIVE:

- Understands the concept and place of research in concerned subject
- Gets acquainted with various resources for research
- Becomes familiar with various tools of research
- Gets acquainted with sampling techniques, methods of research and techniques of analysis of data
- Achieves skills in various research writings
- Gets acquainted with computer Fundamentals and Office Software Packages .

UNIT - 1 12 Hrs

Tribal Studies : Meaning, Nature, Scope, Need & Importance of tribal studies. Meaning, Definition & characteristics of Caste, Caste & Race.

UNIT - 2 24 Hrs

Scheduled Tribe in India : Population Composition of tribal, classification of Indian Tribe – Racial, Linguistic, Geographical, Official.

Some Major Tribes in India : Gondwal, Khasi, Munda, Bodo.

Some Major Tribes in Central India : Gond, Bhilala, Bhatra, Korkus.

UNIT - 3 18 Hrs

Illiteracy : Poverty, Indebtedness, Unemployment, migration & Exploitation, Environmental & Degradation.

Problem of Health and sanitation :

Prostitution, Cultural Decay, Inter-communication, Rehabilitation & Rehabilitation of Tribal population.

UNIT - 4 24 Hrs

Welfare Concept, Characteristics: Tribal Welfare in pre independence period, Constitutional provisions & safe guard after independence, Legislation & Reservation Policy.

UNIT - 5 30 Hrs

Tribal Development Programs for Scheduled Tribes : Medical, Education, Economy, Employment & Agriculture, Evaluation of Programs.

Tribal Welfare & Advisory Agencies in India : Role of NGO's in tribal development, Role of Christian missionaries in tribal welfare & development, Tribal Welfare Administration.

SUGGESTED READINGS

1. *Tribal Development & Media* (Odisha) by Dr. Tripathi
2. *Books on Tribal studies* by PK Bhowmik
3. *Books on Tribal Studies* by W.G. Archer

M.Sc. in PHYSICS
(THIRD SEMESTER)

COURSE CODE: MSP [illegible] **COURSE TYPE:** [illegible]

COURSE TITLE: MICROWAVE ELECTRONICS

CREDIT: 06	**HOURS :** 90
THEORY: 06	**THEORY:** 90

MARKS : 100
THEORY: 70 **CCA :** 30

OBJECTIVE: The main objective is to learn microwave electronics .

UNIT-1 20Hrs	Waveguides and components: Field distribution in rectangular waveguide in TE and TM modes, Phase velocity, Group velocity, Characteristics impedance, wall current, Cavity resonators and their excitation techniques, Scattering matrix for Microwave Tees and hybrid junction directional coupler. Construction and working of precision attenuator and phase shifter.
UNIT-2 20Hrs	CIRCUIT THEORY OF WAVE GUIDES: Power Transmission in Wave Guides, Equivalent Voltages and Currents, Impedance Description of Wave Guide Elements and Circuits, Foster's Reaction Theorem, One Port Circuits, N-Ports Circuits, Scattering Matrix Formulation, Excitation and Coupling of Wave Guides, Dielectric Loaded Wave Guides, Surface Wave Guides.
UNIT-3 20 Hrs	ANTENNAS: Familiarity with Different Types of Antennas, Radiation Properties, Strip-Lines and Microstrip Lines, Strip-Line Characteristics, Strip-Line Components, Microstrip Antennas, Radiation Properties of Microstrip Antennas.
UNIT-4 15 Hrs	APPLICATIONS OF MICROWAVES: Applications of Microwave in RADAR, Satellite Communication, Mobile Communication, Microwave Heating
UNIT-5 15 Hrs	FERRITES: Microwave Propagation in Ferrites, Nano Ferrites, Synthesis of Nano Ferrites, Dielectric Properties of Ferrites, Ferrites as Microwave Absorbers.
SUGGESTED READINGS	1. Foundations for Microwave Engineering: R.E. Collin, Mc Graw Hill. 2. Solid State Electronic Devices: B. Streetman and S.K. Banerjee, PHI 3. Microwave Devices and Circuits: S.Y. Liao, PHI 4. Antenna Theory and Design: C.A. Balanis, John Wiley & Sons 5. Basic Microwave Techniques and Laboratory Manual: M. L. Sisodia, G. S. Raghuvanshi, New Age International, Jan 1, 1987

M.Sc. in PHYSICS
(THIRD SEMESTER)

COURSE CODE: [illegible] COURSE TYPE : ELECTIVE

COURSE TITLE: **NANO SCIENCE**

CREDIT: 06	HOURS : 90
THEORY: 06	THEORY: 90

MARKS : 100
THEORY: 70 CCA : 30

OBJECTIVE: The main objective is to learn Nano Science .

UNIT-1 20Hrs	Introduction to Nanoparticles Introduction - Historical perspective of nanoparticle - Classification of nanomaterials - Nanorods - Nanoparticle - Nanomaterial preparation - Plasma arching - Chemical vapour deposition - Solgel electrodeposition - Ball milling technique.
UNIT-2 20Hrs	Nanocrystals Synthesis of metal nanoparticles and structures - Background on quantum semiconductors - Background on reverse Micellar solution - Synthesis of semiconductors - Cadmium telluride nano crystals - Cadmium sulfide nano crystals - Silver sulfide nano crystals - Nano manipulator - Nano tweezers - Nanodots.
UNIT-3 20 Hrs	Characteristics of Nanomaterials Magnetism in particle of reduced size dimension - Variation of magnetism with size - Magnetic behavior of small particle - Diluted magnetic semiconductor (DMS) - Fe DMS and its applications. Nanoparticle as chemical reagents - Specific heat of nanoparticle crystals - Melting point of Nanoparticle material - Nanolithography - Estimation of nanoparticle size using AFM.
UNIT-4 15 Hrs	Nano Tubes New form of carbon - Types of nanotubes - Formation of nanotubes - Various techniques - Preparation and properties of nanotubes - Uses of nanotubes and applications - Nano material processing for nanotubes - Light and Nano technology - Nanoholes and photons - Quantum electronic devices - Quantum electronic devices - Quantum information and Quantum Computers.

UNIT-4 15 Hrs	Applications Microelectromechanical systems - Robots - Agile materials - Nanoelectronics - Nano electronics - Optoelectronic devices - LED - Applications - Colourants and pigments - Nano biotechnology - DNA chips - DNA array devices - Drug delivery systems.
SUGGESTED READINGS	1. NANOSCIENCE AND NANO TECHNOLOGY : FRONTIERS OF FUNDAMENTALS BY M.S. RAMCHANDRA RAO . 2. NANO : THE ESSENTIALS . BY : T. PRADEEP

M.Sc. in PHYSICS (THIRD SEMESTER)	
COURSE CODE: MSP C303 **COURSE TYPE:** ECCCB	
COURSE TITLE: HIGH ENERGY PHYSICS - III	
CREDIT: 06 **THEORY:** 06	**HOURS :** 90 **THEORY:** 90
MARKS : 100 **THEORY:** 70 **CCA :** 30	
OBJECTIVE: The main objective is to learn High Energy Physics .	

UNIT-1 20Hrs	Local gauge invariance and Yang Mills fields, Lagrangian of the Spontaneous symmetry breaking and the Higgs mechanism, The Weinberg-Salam model and beyond.
UNIT-2 20Hrs	Unified models of weak and electromagnetic interactions, Standard Model, flavor group, flavor-changing neutral currents. Weak bosons.
UNIT-3 20 Hrs	Quark and lepton mixing, CP violation, Neutrino oscillations.
UNIT-4 15 Hrs	CKM quark mixing matrix, GIM mechanism, rare processes, neutrino masses, seesaw mechanism.
UNIT-5 15 Hrs	QCD confinement and chiral symmetry breaking, instantons, strong CP problem.
SUGGESTED READINGS	1. Francis Halzen and Alan D. Martin, Quarks and Leptons: An Introductory Course in Modern Particle Physics, John Wiley and Sons. 2. B.R. Martin and G. Shaw, Particle Physics, 2nd edition, J. Wiley and Sons (1997). 3. Particle Data Group, The Review of Particle Physics. 4. David Griffiths, Introduction to Elementary Particles. 5. Donald Perkin, Introduction to high energy physics.

DEPARTMENT OF PHYSICS

- M.Sc. in PHYSICS — FACULTY OF SCIENCE
- SECOND SEMESTER (EVEN SEMESTER)

Eligibility Criteria / Qualifying Exams	Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			EoSE Duration (Hrs.)	
					L	T	P	Thy	P
[illegible]	[illegible]	[illegible]	Electronics	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	Electronics Lab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	Atomic and Molecular Physics	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	Quantum Mechanics II	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	Social Outreach and Self Development	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	Fundamentals of Fibre Optics	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	Electronic Instrumentation						
	[illegible]	[illegible]	Condensed Matter - II						
	[illegible]	[illegible]	High Energy Physics - II						
				Total - [illegible]					

M.Sc in PHYSICS (SECOND SEMESTER)			
COURSE CODE:	MSP 201	COURSE TYPE :	CCC
COURSE TITLE:	ELECTRONICS		
CREDIT: 06 THEORY: 06	PRACTICAL: 00	HOURS: 90 THEORY: 90	PRACTICAL: 00
MARKS: 100 THEORY: 70	CCA : 30	PRACTICAL: 00	
OBJECTIVE: The main objective is to learn about Electronics and it's basic concepts			

UNIT-1 20 Hrs.	Operational Amplifiers: Differential amplifier - circuit configurations - dual input, balanced output differential amplifier, DC analysis, inverting and non-inverting inputs, CMRR-constant current bias level translator. Block diagram of typical OP-Amp analysis. Open loop configuration, inverting and non-inverting amplifiers, Op-Amp with negative feedback, voltage series feedback, effect of feed back on closed loop gain, input resistance, bandwidth and output offset voltage, voltage follower. Practical Op-Amp, input offset voltage-input bias current-input offset current, total output offset voltage, CMRR frequency response, DC and AC amplifier, integrator and differentiator.
UNIT-2 15 Hrs	Oscillators: Oscillator Principle, Frequency stability response, the phase shift oscillator, Wein bridge oscillator, LC tunable oscillators.
UNIT-3 15 Hrs	Wave Shaping Circuits : Multivibrators- Monostable, astable and bistable, Comparators, Square wave and triangle wave generation, clamping and clipping circuits.
UNIT-4 30Hrs	Digital Electronics: Combinational logic: Standard representations for logic functions, Karnaugh Map Representation of logical functions, Simplification of logical functions using K-Map, Minimization of Logical functions specified in Minterms / Maxterms or truth table, Don't care conditions, Adder (half and full), Subtractor (half and full) comparator, Multiplexers and their uses, Demultiplexer / Decoders and their uses, BCD arithmetics, Parity generators / Checkers, Code Converters, Priority Encoders, Decoder / Drivers for display devices, Seven Segment display device, ROM, Programmable Logic Array, Basic concepts about fabrication and characteristics of integrated circuits.

UNIT-3 SEMICONDUCTOR DEVICES	Sequential Logic: Flip-Flops: one - bit memory, RS, JK, JK master slave, T and D type flip flops, shift registers - synchronous and asynchronous counters, cascade counters. Binary counter, Decade counter. A/D and D/A conversion- Basic principles, circuitry and simple applications. Voltage regulators - fixed regulators, adjustable voltage regulators, switching regulators. Basic idea of IC 555 and its applications as multivibrator and square wave generator. Opto-electronic Devices: Photo diode, Photoresistor, Light emitting Diode and their applications
SUGGESTED READINGS	1. "Electronic Devices and Circuit Theory" by Robert Boylestad and Louis Nashelsky, PHI, New Delhi - 110001, 1991. 2. "OP-AMP and Linear Integrated Circuits" by Ramakanth, A. Gayakwad, PHI, Second Edition 1991. 3. "Digital Principle and Applications" by A.P. Malvino and Donald P. Leach, Tata McGraw Hill Company, New Delhi, 1993.

M.Sc. in PHYSICS (SECOND SEMESTER)			
COURSE CODE: MSP 211		COURSE TYPE : CCC	
COURSE TITLE: ELECTRONICS LAB			
CREDIT: 06		HOURS: 135	
THEORY: 00	PRACTICAL: 06	THEORY: 00	PRACTICAL: 135
MARKS: 100 PRACTICAL: 100			

LABORATORY WORK MSP211

ELECTRONICS LAB

1.Characteristics of SCR and Triac.

2. SCR and Triac - Switching and power control.

3. Op-amp - Inverting, Non-inverting amplifier - Voltage follower - Summing, difference, average amplifier - differentiator and integrator.

4. Op-amp - Study of the attenuation characteristics and design of the phase-shift Oscillator.

5. Op-amp - Study of the attenuation characteristics and design of the Wien Bridge Oscillator.

6. Op-amp - Solving simultaneous equations.

7. Op-amp - Design of square wave, sawtooth wave, and Triangular wave generators.

8. Op-amp - Design of schmitt Trigger and construction of Monostable multivibrator.

9. Op-amp - Design of active filters - second order - low pass, high pass, band pass and band rejector.

10. Op amp - D.A. convertor - Binary weighted method - R2R ladder method.

11. IC 7400 - Half adder, Half subtractor, Full adder, Full subtractor.

12. IC 7490 - modulo counters.

13.IC 741 - OP AMP

M.Sc in PHYSICS (SECOND SEMESTER)			
COURSE CODE: MSP 202 COURSE TYPE : CCC			
COURSE TITLE: ATOMIC AND MOLECULAR PHYSICS			
CREDIT: 06 THEORY: 06 PRACTICAL: 00		HOURS: 90 THEORY: 90 PRACTICAL: 00	
MARKS: 100 THEORY: 70 CCA : 30		PRACTICAL: 00	
OBJECTIVE: The main objective is to learn about atomic and molecular physics.			
UNIT-1 21 Hrs	Gross structure of energy spectrum of hydrogen atom, Non degenerate first order perturbation method, relativistic correction to energy levels of an atom, atom in a weak uniform external electric field – first and second order Stark effect, calculation of the polarizability of the ground state of hydrogen atom and of an isotropic harmonic oscillator		
UNIT-2 18 Hrs	Degenerate stationary state perturbation theory, Linear Stark effect for hydrogen atom levels, inclusion of spin orbit interaction and weak magnetic field, Zeeman effect, effect of strong magnetic field, Magnetic dipole interaction, hyperfine structure and Lamb shift (only qualitative description).		
UNIT-3 20 Hrs	Indistinguishability and exchange symmetry, many particle wave functions and Pauli's exclusion principle, spectroscopic terms for atoms.The helium atom, Variational method and its use in calculation of ground state energy, Hydrogen molecule, Heitler London method for hydrogen molecule, WKB method for one dimensional problem, application to bound states (Bohr Sommerfeld quantization) and the barrier penetration.		
UNIT-4 20Hrs	Spectroscopy (qualitative):General features of the spectra of one and two electron system – singlet, doublet and triplet characters of emission spectra, general features of alkali spectra. Rotation and vibration band spectrum of a molecule, P,Q and R branches. Raman spectra for rotational and vibrational transitions, comparison with infrared spectra – application to learning about molecular symmetry. General features of electronic spectra, Frank and Condon's principle.		

UNIT – 4 15Hrs	Laser cooling and trapping of atoms: The scattering force: slowing an atomic beam, chirp cooling, optical molasses technique. Doppler cooling limit, magneto optical trap. Introduction to the dipole force, theory of the dipole force, optical lattice. Sisyphus cooling technique – description and its limit. Atomic fountain. Magnetic trap (only qualitative description) for confining low temperature atoms produced by Laser cooling, Bose-Einstein condensation in trapped atomic vapours, the scattering length, Bose-Einstein condensate, coherence of a Bose-Einstein Condensate, The Atom Laser.
SUGGESTED READINGS	1. G. Banwell – Atomic and Molecular spectroscopy 2. Christopher J. Foot – Atomic Physics, Oxford Master series, 2005 3. G.K. Woodgate. Elementary Atomic Structure, Second Edition Clarendon Press Oxford. 4. T.A. Littlefield - Atomic and Molecular Physics. 5. Eisberg and Resnick- Quantum Physics of Atoms, Molecules Solids and Nuclear Particles. 6. Ashok Das and A.C. Melissinos. Quantum Mechanics : A Modern Approach (Gordon and Breach Science Publishers) 7. White - Atomic Spectra. 8. Herzberg- Molecular spectra.

M.Sc. in PHYSICS (SECOND SEMESTER)			
COURSE CODE:	MSP 203	COURSE TYPE :	CCC
COURSE TITLE:	QUANTUM MECHANICS II		
CREDIT: 06 THEORY: 06	PRACTICAL: 00	HOURS: 90 THEORY: 90	
MARKS: 100 THEORY: 70	CCA : 30		

OBJECTIVE: The main objective is to learn about quantum mechanics.

UNIT-I 20 Hrs.	Scattering Theory The scattering problem - formulation - Scattering amplitude - cross sections - Transformation from centre of mass to laboratory frame- Partial wave analysis - optical theorem - Phase shifts - Scattering length and effective range - Low energy scattering - Born approximation and its validity.
UNIT-2 15 Hrs	Perturbation Theory Time dependent perturbation theory - Constant and harmonic perturbations - Transition probabilities - Fermi's-Golden rule - Selection rules for dipole radiation - Adiabatic approximation - Sudden approximation - The density matrix - spin density matrix and magnetic resonance - Semi classical treatment of an atom with electromagnetic radiation.
UNIT-3 20 Hrs	Relativistic Quantum Mechanism Klein-Gordon equation - Failures - Dirac equation - Plane - wave solutions - Interpretation of negative energy states - Antiparticles - Spin of electron - Magnetic moment of an electron due to spin - Energy values in a coulomb potential.
UNIT-4 20Hrs	Dirac equation Covariant form of Dirac equation - properties of gamma matrices - Traces - Separation of the equation and the Hydrogen atom problem - Invariance of Dirac equation under Lorentz transformation - Y-Transformation for the Dirac equation in presence of electro magnetic field.

UNIT-5 (8 Hrs)	Quantisation of Fields Relativistic Lagrangian and Hamiltonian of a charged particle in an electromagnetic field - The Lagrangian and Hamiltonian formulations of field - Second quantization of Klein-Gordon field - creation and annihilation operators - Commutation relations - Quantization of electromagenetic field - Quantization of Schroedinger's field - Quantization of Dirac field.
SUGGESTED READINGS	1. Ashok Das and A.C. Milssiones : Quantum mechanics - A Modern Approach, Gordan and Breach Science Publishers. 2. J.J. Sakurai : Advanced Quantum Mechanics (John Wiley) 3. E. Merzbacher, 1970, Quantum Mechanics, 2nd Edition, John Wiley and Sons, New York. 4. J.D. Bjorken and S.D. Drell, 1964, Relativistic Quantum Mechanics, McGraw-Hill, New York. 5. V.K. Thankappan, 1985, Quantum Mechanics, 2nd Edition, Wiley Eastern Ltd, New Delhi. 6. L.D. Landau and E.M. Lifshitz, 1958 Quantum Mechanics, Pergamon Press, London. 7. G. Aruldhas, 2002, Quantum Mechanics, Prentice-Hall of India, New Delhi.

M.Sc in PHYSICS (SECOND SEMESTER)			
COURSE CODE : MSPH01		COURSE TYPE : FCCSCH	
COURSE TITLE: ENVIRONMENTALAND FOREST LAWS			
CREDIT: 06 THEORY: 06		HOURS : 90 THEORY: 90	
MARKS : 100 THEORY: 70	CCA : 30		
OBJECTIVES: – Understands the concept and place of research in concerned subject. – Gets acquainted with various resources for research. – Becomes familiar with various methods of research. – Gets conversant with sampling techniques, methods of research and techniques of analysis of data. – Achieves skills in various research activities. – Gets acquainted with computer Fundamentals and Office Software Package.			
UNIT – 1 18 Hrs	EVOLUTION OF FOREST AND WILD LIFE LAWS a) Importance of Forest and Wildlife b) Evolution of Forest and Wild Life Laws c) Forest Policy during British Regime d) Forest Policies after Independence. e) Methods of Forest and Wildlife Conservation.		
UNIT – 2 18 Hrs	FOREST PROTECTION AND LAW a) Indian Forest Act, 1927 b) Forest Conservation Act, 1980 & Rules thereon c) Rights of Forest Dwellers and Tribal e) The Forest Rights Act, 2006 d) National Forest Policy 1988		
UNIT – 3 18 Hrs	WILDLIFE PROTECTION AND LAW a) Wild Life Protection Act, 1972 b) Wild Life Conservation strategy and Projects c) The National Zoo Policy		

UNIT – 4 15 Hrs	**CHAPTER – BASIC CONCEPTS** a. Meaning and definition of environment b Multidisciplinary nature of environment c. Concept of ecology and ecosystem d Importance of environment e Meaning and types of environmental pollution f Factors responsible for environmental degradation. **CHAPTER– INTRODUCTION TO LEGAL SYSTEM** a. Acts, Rules, Policies, Notifications, Circulars etc b Constitutional provisions for Environment Protection c. Judicial review, precedents d Writ petitions, PIL and Judicial Activism **CHAPTER – LEGISLATIVE FRAMEWORK FOR POLLUTION CONTROL LAWS** a) Air Pollution and Law b) Water Pollution and Law. c) Noise Pollution and Law.
UNIT – 5 15 Hrs	**CHAPTER– LEGISLATIVE FRAMEWORK FOR ENVIRONMENT PROTECTION** a) Environment Protection Act & rules there under b) Hazardous Waste and Law c) Principles of Strict and absolute Liability d) Public Liability Insurance Act e) Environment Impact Assessment Regulations in India **CHAPTER – ENVIRONMENTAL CONSTITUTIONALISM** a. Fundamental Rights and Environment i) Right to Equality ……Article 14 ii) Right to Information ……Article 19 iii) Right to Life ……Article 21 iv) Freedom of Trade vis-à-vis Environment Protection b The Forty Second Amendment Act c. Directive Principles of State Policy & Fundamental Duties d. Judicial Activism and PIL

SUGGESTED READINGS

Bharucha, Erach. Text Book of Environmental Studies. Hyderabad – University Press (India) Private limited, 2005.
Desika, T. S. Environmental and Pollution Laws in India. New Delhi: Wadhwa and Company, 2005.
Joseph, Benny. Environmental Studies, New Delhi: Tata McGraw-Hill Publishing Company Limited, 2006.
Khan, I. A. Text Book of Environmental Laws. Allahabad: Central Law Agency, 2002.
Leelakrishnan, P. Environmental Law Case Book. 2nd Edition. New Delhi: LexisNexis Butterworths, 2006.
Leelakrishnan P. Environmental Law in India. 2nd Edition. New Delhi: LexisNexis Butterworths, 2005.
Sinha, S.C. (ed). Human Rights, Development and Environmental Law: An Anthology. Jaipur: Bharat Law Publications, 2008.
Environmental Pollution by Asthana and Asthana, S.Chand Publication
Environmental Science by Dr. S.K.Meena, Asia pac House
Gurdip Singh, Environmental Law in India (2006) Macmillan.
Shyam Divan and Armin Rosencranz, Environmental Law and Policy in India – Cases, Materials and Statutes (2nd ed., 2001) Oxford University Press.

JOURNALS :-
Journal of Indian Law Institute, ILI New Delhi.
Journal of Environmental Law, NLSIU, Bangalore.

MAGAZINES :-
Economical and Political Weekly
Down to Earth.

M.Sc. in PHYSICS (SECOND SEMESTER)			
COURSE CODE:	MSP 202	COURSE TYPE :	ECCCB
COURSE TITLE:	ELECTRONIC INSTRUMENTATION		
CREDIT: 06 THEORY: 06		HOURS : 90 THEORY: 90	
MARKS : 100 THEORY: 70	CCA : 30		

OBJECTIVE: The main objective is to learn about electronic instrumentation .

UNIT-I 18 Hrs	Transducers : Classification of Transducers - Principle, construction and working of Thermistor, LVDT, Electrical strain gauges and capacitive transducers. Measurement of non-electrical quantities - Strain, Displacement, temperature, Pressure and Force.
UNIT-II 20 Hrs	Digital Instrumentation : Principle, block diagram and working of Digital frequency counter, digital multimeter, digital pH meter, digital conductivity meter and digital storage oscilloscope.
UNIT-III 20 Hrs	Analytical Instrumentation : Principle, block diagram description, working and applications of UV-VIS spectrometer, IR spectrometer, Flame emission spectrometer and ICP - AES spectrometer - Basic concepts of Gas and Liquid Chromatography.
UNIT-IV 18 Hrs	Bio Medical Instrumentation : Physiological transducers to measure blood pressure, body temperature. Sources of Bio-electric potentials - resting potential, action potential, bio-potential electrodes. Principle, block diagram and operation of ECG and EEG - recorders.
UNIT-V 15 Hrs	Computer Peripherals : Printers - Printer mechanism - Classification, Dot matrix, Ink jet and laser printers. Basic concepts of key board and mouse. Mass data storage - floppy disk -Hard Disk - Optical disk (CD)

SUGGESTED READINGS	
SUGGESTED READINGS	1. Dr. Rajendra Prasad, Electronic Measurements and Instrumentation, Khanna Publications. 2. S. Ramabhadran, Electronic Measurements and Instrumentation, Khanna Publications. 3. G.M. Dhir, Electronics and Instrumentation, Khanna Publishers, Khandpur

M.Sc. in PHYSICS
(SECOND SEMESTER)

COURSE CODE: MSP [illegible] **COURSE TYPE :** [illegible]

COURSE TITLE: CONDENSED MATTER PHYSICS - II

CREDIT: 06	**HOURS :** 90
THEORY: 06	**THEORY:** 90

MARKS : 100
THEORY: 70 **CCA :** 30

OBJECTIVE: The main objective is to learn about condensed matter physics .

UNIT-I 20Hrs.	Disordered systems: Substitutional, positional and topographical disorder, short and long range order, glass transition, glass forming ability, nucleation and growth processes. Anderson model for random system and electron localization, mobility and hopping conduction. Metal glasses, models for structure of metal glasses. Structure factor for binary metallic glasses and its relationship with radial distribution function. Discussion of electric, magnetic and mechanical properties of glassy systems. Point defects: shallow impurity states in semiconductors. Localized lattice vibrational states in solids. Vacancies, interstitials and colour centres in ionic crystals
UNIT-2 20 Hrs	Nanomaterials: Free electron theory (qualitative idea), variation of density of states with energy, variation of density of states and band gap with size of crystal. Electron confinement in infinitely deep square well, confinement in two and one dimensional well. Idea of quantum well structure , tunneling through potential barrier, quantum dots, quantum wires.

UNIT-I (15 Hrs)	Different methods of preparation of nanomaterials. Sol-gel and chemical co-precipitation method, effect of temperature on the size of the particles. Bottom up: cluster beam evaporation, ion beam deposition, top down: ball milling. DC and RF sputtering.
UNIT-II (15 Hrs)	Films and surfaces: Study of surface topography by multiple beam interferometry, conditions for accurate determination of step height and film thicknesses (Fizeau fringes) Electrical conductivity of thin films, difference of behaviour of thin films from bulk material. Boltzman transport equation for a thin film (for diffuse scattering), expression for electrical conductivity for thin film. Enhancement of magnetic anisotropy due to surface pinning.
UNIT-III (15 Hrs)	Experimental techniques: Basic ideas of the techniques of field emission, scanning tunneling and atomic force microscopy, scanning electron microscopy, transmission electron microscopy, X-ray diffraction line broadening, small angle X-ray scattering and small angle neutron scattering.
SUGGESTED READINGS	1.Tolansky: Multiple beam interferometry 2. Heavens: Thin films 3.Chopra: Physics of thin films 4. Quantum dot nanostructures: D. Bimberg, M. Grundmann and N.N. Ledentsov, John Wiley & Sons 1998 5. Nano particles and nano structured films – preparation, characterization and applications, Ed. J.H. Fendler, John Wiley & Sons 1998. 6. Physics of low dimensional semiconductors: John H. Davies, Cambridge Univ. Press, 1997 7. Physics of semiconductor nano structures: K.P. Jain, Narosa, 1997

M.Sc. in PHYSICS (SECOND SEMESTER)	
COURSE CODE: MSP	COURSE TYPE : ECC-CII
COURSE TITLE: **HIGH ENERGY PHYSICS - II**	
CREDIT: 06 THEORY: 06	HOURS : 90 THEORY: 90
MARKS : 100 THEORY: 70 CCA : 30	
OBJECTIVE: The main objective is to learn about high energy physics .	

UNIT-1 20Hrs	Moller scattering, trace theorems and properties of gamma matrices, helicity representation at high energies, the electron propagator, the photon propagator.
UNIT-2 20 Hrs	Structure of Hadrons: form factors, e-p scattering, inelastic e-p scattering, Bjorken scaling, Partons, gluons, deep inelastic scattering, evolution equations for parton densities.
UNIT-3 20 Hrs	QCD: Electron positron annihilation into hadrons, heavy quark production, three jet events, QCD corrections, Perturbative QCD, Drell-Yan process
UNIT-4 15 Hrs	Weak Interactions: Parity violation, V-A form of weak interaction, Nuclear beta decay, muon decay, pion decay, neutrino electron scattering, neutrino quark scattering, weak neutral currents, the Cabibbo angle, weak mixing angles, CP invariance.
UNIT-5 15 Hrs	Gauge Symmetries: U(1) Local gauge invariance and QED, Non-abelian gauge invariance and QCD, massive gauge bosons, spontaneous breakdown of symmetry, the Higgs mechanism.
SUGGESTED READINGS	1. Francis Halzen and Alan D. Martin, Quarks and Leptons: An Introductory Course in Modern Particle Physics, John Wiley and Sons. 2. B.R. Martin and G. Shaw, Particle Physics, 2nd edition, J. Wiley and Sons (1997). 3. David Griffiths, Introduction to Elementary Particles 4. Byron Roe Particle Physics at the New Millennium 5. Donald Perkin, Introduction to high energy physics.

DEPARTMENT OF PHYSICS

- M.Sc. in PHYSICS FACULTY OF SCIENCE
- FIRST SEMESTER [illegible]

[illegible]	[illegible]	Course Code	Course Type	Course (Paper/Subjects)	Credits	[illegible] Per Week			[illegible] Duration (Hr.)	
						L	T	P	Th	P
[illegible]	[illegible]	[illegible]	[illegible]	Mathematical Physics	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	Classical Mechanics	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	Quantum Mechanics I	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	Electronic Devices and Applications						
		[illegible]	[illegible]	Condensed Matter Physics - I						
		[illegible]	[illegible]	High Energy Physics - I						
					TOTAL [illegible]					

M.Sc. in PHYSICS (FIRST SEMESTER)			
COURSE CODE:	MSP101	COURSE TYPE :	CCC
COURSE TITLE: MATHEMATICAL PHYSICS			
CREDIT: 06 THEORY: 06	PRACTICAL: 00	HOURS: 90 THEORY: 90	PRACTICAL: 00
MARKS: 100 THEORY: 70	CCA : 30	PRACTICAL: 00	

OBJECTIVE: The main objective is to learn about Mathematical Physics .

UNIT-I 18 Hrs.	Complex Variables Analytic function - kinds of singularity - Line integrals and Cauchy's theorem - Taylor and Laurent expansions - Residue theorem - Application to evaluation of definite integrals - conformal mapping and invariance of Laplacian in two dimensions - Representation of functions by contour integral.
UNIT-2 20 Hrs.	Linear Differential equations and Green's function Second order linear differential equations - Liouville's Theorem - Orthogonality of eigenfunctions - Illustration with Legendre, Laguerre, Hermite and Chebyshev differential equations - Location of Zeros of these polynomials - Wronskian, ordinary and singular points - Green's function- Eigenfunction expension of Green's function - Reciprocity theorem - Liouville type equations in one dimension and their Green's function.
UNIT-3 20 Hrs.	Laplace and Fourier transforms Laplace transforms - Solution of linear differential equations with constant Coefficients - Fourier integral - Fourier transforms, Fourier sine and cosine transforms - Convolution theorems - Applications.
UNIT-4 20 Hrs.	Tensor Analysis Definition of scalars - contravariant Vectors and Covariant Vectors - Einstein's summation convention - Definition of tensors - Second rank cartesian tensor as operator - Symmetric and antisymmetric tensors - tensors of rank higher than two - Spectric Tensors - Covariant derivatives.

UNIT – 4	Group Theory Definition of groups, subgroups and conjugate classes - Symmetry elements. Transformation. Matrix representation - Point groups - representation of a group - Reducible and irreducible representations - Orthogonality theorem - character of a representation - character Table C_{3v} and C_{2v} - Application to Infrared and Raman active vibrations of XY_3 type molecules - Projection operators applied to an equilateral triangle - Rotation group and angular momenta.
SUGGESTED READINGS	1. Mathematical Methods for Physicists: George Arfken , Academic Press 2. Applied Mathematics for Engineers and Physicists: L. A. Pipe , McGraw Hill 3. Mathematical Methods - Potter and Goldberg , Prentice Hall of India 4. Elements of Group Theory for Physicists: A.W. Joshi, Wiley Eastern Ltd. 5. Vector Analysis (Schaum Series), McGraw Hill

M.Sc. in PHYSICS (FIRST SEMESTER)			
COURSE CODE:	MSP111	COURSE TYPE :	CCC
COURSE TITLE:	GENERAL EXPERIMENTS		
CREDIT: 06		HOURS: 135	
THEORY: 00	PRACTICAL: 06	THEORY: 00	PRACTICAL: 135

LABORATORY WORK
SEM III

GENERAL EXPERIMENTS

1. Cornu's method - Young's modulus by elliptical fringes.

2. Cornu's method - Young's modulus by hyperbolic fringes.

3. Determination of Stefan's constant.

4. Band gap energy - Thermister.

5. Hydrogen spectrum - Rydberg's constant.

6. Co-efficient of linear expansion - Air wedge method.

7. Permittivity of a liquid using RFO.

8. Viscosity of liquid - Meyer's disc.

9. Solar spectrum - Hartmann's Interpolation formula

10. F.P. Etalon using spectrometer.

11. Iron / Copper arc spectrum.

12. Brass / Alloy arc spectrum.

M.Sc in PHYSICS (FIRST SEMESTER)			
COURSE CODE:	MSP101	COURSE TYPE:	CCC
COURSE TITLE: CLASSICAL MECHANICS			
CREDIT: 06 THEORY: 06 PRACTICAL: 00		HOURS: 90 THEORY: 90 PRACTICAL: 00	
MARKS: 100 THEORY: 70 CCA : 30		PRACTICAL: 00	
OBJECTIVE: The main objective is to learn about Classical Mechanics .			

UNIT-1 15Hours	Rigid body dynamics Angular momentum, rotational kinetic energy and moment of inertia of a rigid body - Euler's angles - Euler's equations of motion - Torque - free motion of a rigid body - Motion of a symmetrical top under the action of gravity.
UNIT-2 30Hours	Constraints : holonomic and non-holonomic constraints, D'Alembert's Principle and Lagrange's Equation, velocity dependent potentials, simple applications of Lagrangian formulation, Hamilton Principle, Calculus of Variations, Derivation of Lagrange's equation from Hamilton's principle, Extension of Hamilton's Principle for non-conservative and nonholonomic systems, Method of Lagrange's multipliers, Conservation theorems and Symmetry Properties, Noether's theorem. Conservation of energy, linear momentum and angular momentum as a consequence of homogeneity of time and space and isotropy of space.
UNIT-3 30Hours	Generalized momentum, Legendre transformation and the Hamilton's Equations of Motion, simple applications of Hamiltonian formulation, cyclic coordinates, Routh's procedure, Hamiltonian Formulation of Relativistic Mechanics, Derivation of Hamilton's canonical Equation from Hamilton's variational principle, The principle of least action.
UNIT-4 30Hrs	Canonical transformation, integral invariant of poincare; Lagrange's and Poisson brackets as canonical invariants, equation of motion in Poisson bracket formulation, Infinitesimal contact transformation and generators of symmetry, Liouville's theorem, Hamilton-Jacobi equation and its application.

UNIT - V TOPICS	Action angle variable adiabatic invariance of action variable: The Kepler problem in action angle variables, theory of small oscillation in Lagrangian formulation, normal coordinates and its applications.
SUGGESTED READINGS	1. H. Goldstein, 2002, Classical Mechanics, 3rd Edition. C. Poole and J.Safko, Pearson Education, Asia, New Delhi. 2. S.N. Biswas, 1998, Classical Mechanics, Books and Allied Ltd., Kolkata. 3. L.D. Landau and E.M. Lifshitz, 1969, Mechanics, Pergamon Press, Oxford. 4. K.R. Symon, 1971, Mechanics, Addison Wesley, London. 5. J.L. Synge and B.A Griffith, 1948, Principles of Classical Mechanics, Mc. Graw-Hill, New York. 6. C.R.Mondal, Classical Mechanics, Prentice - Hall of India, New Delhi. 7. A. Raychoudhary , Classical Mechanics, Oxford University Press.

M.Sc. in PHYSICS (FIRST SEMESTER)	
COURSE CODE: MSP 10[illegible] COURSE TYPE: CCC	
COURSE TITLE: QUANTUM MECHANICS I	
CREDIT: 06	HOURS: 90
THEORY: 06	THEORY: 90
MARKS: 100 THEORY: 70 CCA : 30	
OBJECTIVE: The main objective is to learn about Quantum Mechanics.	

UNIT-1 18 Hrs.

Basic formalism

Wave functions for a free particle - Interpretation and conditions on the wave function - Postulates of quantum Mechanics and the Schroedinger equation - Ehrenfest's theorem – Operator formalism – Linear operators – Self adjoint operators - Expectation Value - Stationary States - Hermitian Operators for dynamical variables - Eigen values and eigen function - Orthonormality - Uncertainty Principle.

UNIT-2 18 Hrs

Applications

Ladder operators and simple harmonic oscillator - Rigid rotator - Step Potential - Particle in a central potential - Particle in a periodic potential - Orbital angular momentum and spherical harmonics - Central forces and reduction of two body problem - Particle in a Spherical well - Hydrogen atom.

UNIT-3 18 Hours

General formalism:

Hilbert's space - Dirac notation - Representation theory - Co-ordinate and momentum representations - Time evolution - Schroedinger, Heisenberg and Interaction pictures - Symmetries and conservation laws - Unitary transformations associated with translations and rotations.

UNIT – II 20Hrs	Approximation methods Time-independent perturbation theory for non- degenerate and degenerate levels - Application to ground state of anharmonic oscillator and Stark effect in Hydrogen - Variation method - Application to ground state of Helium atom - WKB approximation - WKB quantization rule - Application to simple Harmonic Oscillator.
UNIT – III 20Hrs	Angular momentum and identical particles Commutation rules for angular momentum operators - Eigen value spectrum from angular momentum algebra - Matrix representation - Spin angular momentum - Non-relativistic Hamiltonian including spin - Addition of two angular momenta - Clebsch - Gordan coefficients - Symmetry and anti symmetry of wave functions - Pauli's spin matrices.
SUGGESTED READINGS	1. P.M. Mathews and K. Venkatesan, 1978, A Text book of Quantum Mechanics Tata McGraw Hill, New Delhi. 2. L.I. Schiff, 1968, Quantum Mechanics, 3rd Edition, International Student Edition McGraw Hill Kogakusha, Tokya. 3. V. Devanathan, 2005, Quantum Mechanics, Narosa Publishing House, New Delhi. 4. E. Merzbacher, 1970, Quantum Mechanics 2nd Edition, John Wiley and Sons, New York. 5. V.K. Thankappan, 1985, Quantum Mechanics, 2nd Edition, Wiley Eastern Ltd New Delhi. 6. P.A.M. Dirac, 1973, The Principles of Quantum Mechanics, Oxford University Press, London. 7. L.D. Landau and E.M. Lifshitz, 1976, Quantum Mechanics, Pergaman Press, Oxford. 8.Ashok Das and A.C. Melissinos, Quantum Mechanics : A modern approach (Gordon and Breach Science Publishers).

COURSE CODE: MSPSHECRSECTYPE30EC

COURSE TITLE:RESEARCH METHODOLOGY & COMPUTER APPLICATION: BASICS

CREDIT: 06	HOURS : 90
THEORY: 06	THEORY: 90

MARKS : 100
THEORY: 70 CIA : 30

OBJECTIVE:

- Understands the concept and place of research in concerned subject
- Gets acquainted with various resources for research
- Becomes familiar with various tools of research
- Gets conversant with sampling techniques, methods of research and techniques of analysis of data
- Achieves skills in various research writings
- Gets acquainted with computer Fundamentals and Office Software Package .

UNIT - I (15 Hrs)

CONCEPT OF RESEARCH :

Meaning and characteristics of research , Steps in research process , Types of research – i) Basic, applied and action research ii) Quantitative and qualitative research , Areas of research in various disciplines

SELECTION OF PROBLEM FOR RESEARCH :

Sources of the selection of the problem , Criteria of the selection of the problem ,Drafting a research proposal , Meaning and types of variable ,Meaning and types of hypothesis.

UNIT - II (15 Hrs)

TOOLS OF RESEARCH :

Meaning and general information about construction procedure of i) Questionnaire, (ii) Interview, (iii) Psychological test, (iv) observation (v) Rating scale (vi) Attitude scale and (vii) check list , Advantages and disadvantages of above tools

SAMPLING :

Meaning of population and sample , Importance and characteristics of sample , Sampling techniques – i) Probability sampling : random sampling, stratified random sampling, systematic sampling, cluster sampling ii) Non-probability sampling: Incidental sampling, purposive sampling, quota sampling

UNIT - III (15 Hrs)

METHODS OF RESEARCH

Meaning and conduction procedure of following methods of research : Historical method , Survey method , Case study , Causal comparative method , Developmental methods , Experimental methods

UNIT - IV (15 Hrs)

TREATMENT OF DATA :

Level of measurements of data , Steps in treatment of data: editing, coding, classification, tabulation, analysis and interpretation of results

WRITING RESEARCH REPORT :

Sections of report : Preliminary section , Content section , various chapters , Supplementary section: appendices, references, abstract , Format and style

UNIT - 3 15 Hrs	**Computer Fundamentals** **Computer System :** Features, Basic Applications of Computer, Generations of computers. **Parts of Computer System :** Block Diagram of Computer System ; Central Processing Unit (CPU) ; Concepts and types of Hardware and Software, Input Devices - Mouse, Keyboard, Scanner, Bar Code Reader, track ball ; Output Devices - Monitor, Printer, Plotter, Speaker ; Computer Memory - primary and secondary memory, magnetic and optical storage devices. **Operating Systems - MS Windows :** Basics of Windows OS ; Components of Windows - icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders ; **Control panel** - display properties, adding and removing software and hardware, setting date and time, screensaver and appearance ; **Windows Accessories :** Calculator, Notepad, WordPad, Paint Brush, Command Prompt, Windows Explorer.
UNIT - 4 15 Hrs	**Office Software Package** **Word Processing - MS Word :** Creating, Saving, Opening, Editing, Formatting, Page Setup and printing Documents ; Using tables, pictures, and charts in Documents ; Using Mail Merge sending a document to a group of people and creating form, letters and label. **Spreadsheet - MS Excel :** Opening a Blank or New Workbook, entering data/Function/ Formula into worksheet cell, Saving, Editing, Formatting, Page Setup and printing Workbooks. **Presentation Software - MS Power Point :** Creating and enhancing a presentation, modifying a presentation, working with visual elements, adding Animations & Transitions and delivering a presentation.
SUGGESTED READINGS	*Agrawal, Y. P. (1988). **Better sampling : Concepts, Techniques and Evaluation.** New Delhi : Sterling Publishers Private Ltd. Best, J. W. (1993).* ***Research in Education** (6th ed.) New Delhi : Prentice Hall of India Pvt. Ltd.* *Bawan, K. D. (1997) **Experimental design in Behavioral Research** (2nd ed.).* *New Delhi : Wiley Eastern Limited.* *Dasgupta, A. K. (1968). **Methodology of Economic Research.** Bombay : Asia Publishing House.* *Edwards, A. L. (1957). **Techniques of Attitude Scale construction.** New York : Appleton-Century* *Gall, M. D., Gall, J. P. and Borg, W. R. (2007). **Educational Research : An Introduction*** *(8th ed.) Boston : Allyn and Bacon.* *Garrett, H. E. & Woodworth, R. S. (1969). **Statistics in Psychology and Education.** Bombay : Vakils, Feffer & Simons Pvt. Ltd.* *Goode, W. J. & Hatt, Paul K. (1952). **Methods in Social Research.** New York : McGraw-Hill* *Gopal, M. H. (1964). **An Introduction to research Procedure in Social Sciences.** Bombay : Asia Publishing House.* *Hillway, T. (1964) **Introduction to Research** (2nd ed.). Boston : Houghton Mifflin* *Hyman, H. H., et al. (1975). **Interviewing in Social Research.*** *Chicago : University of Chicago Press.* *Kerlinger, F. N. (1986) **Foundation of Behavioral Research.** (2nd Indian Reprint)* *New York : Holt, Rinehart and Winston.* *Kothari, C. R. (2007) **Research Methodology : Methods & Techniques** (2nd ed.).* *New Delhi : Wishwa Prakashan Fundamentals Of Computers : Dr. P. Mohan, Himalaya Publishing House.* *Microsoft First Look Office 2010, K. Murray, Microsoft Press.* *Fundamentals Of Research Methodology And Statistics, Y.K. Singh, New Age International (P) Limited, Publishers Practical Research Methods, Dr Catherine Dawson.* *The Essence Of Research Methodology, Jan Jonker & Bartjan Pennink, Springer.*

M.Sc. in PHYSICS
(FIRST SEMESTER)

COURSE CODE: MSPA01 COURSE TYPE: ECOCB

COURSE TITLE: CONSTITUTIONALISM & INDIAN POLITICAL SYSTEM

CREDIT: 06	**HOURS : 90**
THEORY: 06	**THEORY: 90**

MARKS : 100
THEORY: 70 CCA : 30

OBJECTIVE:

- Understands the concept of Constitutionalism
- Gets acquainted with various Indian Political System
- Becomes familiar with various Union Executive
- Gets conversant with legislatures, Legislative Bills
- Achieves skills in various writings

UNIT - 1 12 Hrs	Unit- I: Meaning: Constitution, Constitutional government & constitutionalism; Difference between Constitution & Constitutionalism; Constitutionalism: Basis, Elements, Features & future. Forms of Government: Democracy & Dictatorship, Unitary & Federal, Parliamentary & Presidential form. Ideals of the Indian Constitution incorporated in the Preamble. Special Features of the Indian Constitution.
UNIT - 2 24 Hrs	Unit-II: Concept of State and Citizenship, Judicial Review and Fundamental Rights, Directive Principles of the State Policy, Fundamental Duties, Procedure to Amend the Indian Constitution, Judiciary: Supreme Court and High Court, Judicial Activism and Public Interest Litigation and Provisions relating to Emergency.
UNIT - 3 10 Hrs	Unit-III: Union Executive- President, Prime Minister, Council of Ministers, State Executive- Governor, Chief Minister and Council of Ministers, Local Bodies & Panchayati Raj.
UNIT - 4 24 Hrs	Unit-IV: Parliament of India, State Legislatures, Legislative Bills: Ordinary, Money and Financial, Union State Relations, Principles of the 'Separation of Power and the 'Principles of Check & Balance'. Political Parties and Pressure Groups. Challenges before Indian Democracy: Terrorism, Regionalism, Communalism, Linguistics and National Integration.
UNIT - 5 20 Hrs	Unit-V: Controller & Accountant General of India, Solicitor General, Advocate General, Election Commission, Union and State(s) Public Service Commission, Finance Commission.

SUGGESTED READINGS

HOBBES, Thomas, The Leviathan, Chapters XIII & XIV (any)
LOCKE, John, the Second Treatise of Civil Government, Chapter II (any)
ROUSSEAU, Jean-Jacques, The Social Contract or Principles of Political Right
MONTESQUIEU, The spirit of the laws,
RAZ, Joseph, "The rule of law and its virtue", in The authority of law, Oxford University Press, 1979
Dicey on British constitution
P. Ishwara Bhat Indo relationship between Fundamental Rights
M P Jain Indian Constitutional Law
H M Seervai Constitutional Law of India
V N Shukla Constitution of India
J Dhiraj Shorter Constitution of India
B Sivarao Constitutional Assembly Debates
J. V R Krishna Iyer Fundamental Rights and Directive Principles
Paras Diwan Human Rights and the Law
P K Tripathi Some Insight into Fundamental Rights
S P Sathe Fundamental Rights and Amendment to the Constitution
B R Ambedkar Law, Liberty and Social Justice
David Kinley Nature of Law

M.Sc. in PHYSICS (FIRST SEMESTER)			
COURSE CODE:	MSPA01	COURSE TYPE :	CORE-II
COURSE TITLE:	Electronic Devices and Applications		
CREDIT: 06 THEORY: 06		HOURS: 90 THEORY: 90	
MARKS: 100 THEORY: 70	CCA : 30		

OBJECTIVE: The main objective is to learn about Electronic Devices and Applications

UNIT-I 20Hrs	Fabrication of IC and logic families Fabrication of IC - Monolithic integrated circuit fabrication - IC pressure transducers - Monolithic RMS - Voltage measuring device - Monolithic voltage regulators - Integrated circuit multipliers - Intergrated circuit logic - Schottky TTL - ECL - I2L - P and NMOS Logic - CMOS Logic - Tristate logic circuits.
UNIT-II 20Hrs	Opto electronic devices Light sources and Displays - Light emitting diodes - Surface emitting LED – Edge Emitting LED - Seven segment display - LDR - Diode lasers - Photo detectors - Basic parameters - Photo diodes - p-i-n Photo diode - Solar cells - Photo transistors - IR and UV detectors.
UNIT-III 20Hrs	Timer and applications 555 Timer - Description - Monostable operation - Frequency divider - Astable operation - Schmitt trigger - Phase Locked Loops - Basic principles - Analog phase detector - Voltage Controlled Oscillator - Voltage to Frequency conversion - PLL IC 565 - Description - Lock-in range - Capture range - Application - Frequency multiplication.

UNIT-4 15Hrs	Op-amp applications Instrumentation amplifier - V to I and I to V converter - Op-amp circuits using diodes - Sample and Hold circuits - Log and Antilog amplifiers - Multiplier and Divider - Electronic analog Computation - Schmitt Trigger - Astable, Monostable Multivibrator - Triangular wave generators - Sine wave generators - Rc Active filters.
UNIT-5 15Hrs	Pulse and digital Communication Pulse communications - Introduction - Types - Pulse Amplitude Modulation (PAM) - Pulse Time Modulation - Pulse Width Modulation (PWM) - Pulse Position Modulation (PPM) - Pulse Code Modulation (PCM) - Principles of PCM - Quantizing noise - Generation and Demodulation of PCM - Effects of Noise - Advantages and applications of PCM - Pulse systems - Telegraphy - Frequency-Shift keying - Telemetry - Digital communication - Modem classification - Modes of modem operation - Modem interconnection - Modem interfacing.

SUGGESTED READINGS

1. S.M. Sze, 1985, Semiconductor Devices - Physics and Technology, Wiley, New York.

2. Millman and Halkias, Integrated Electronics, McGraw-Hill, New Delhi.

3. R.A. Gaekwad, 1994, Op-Amps and integrated circuits EEE.

4. Taub and Shilling, 1983, Digital Integrated Electronics, McGraw Hill, New Delhi.

5. J. Millman, 1979, Digital and Analog Circuits and Systems, McGraw-Hill, London.

6. George Kennedy, 1987, Electronic communication systems 3rd Edition, McGraw-Hill, London.

7. R.F. Coughlin and F.F. Driscol, 1988, Op-Amp and linear integrated circuits, Prentice Hall of India, New Delhi.

8. M.S. Tyagi, Introduction to Semiconductor Devices, Wiley, New York.

9. P. Bhattacharya, 2002, Semiconductor Optoelectronic Devices, 2nd Edition, Prentice-Hall of India, New Delhi.

10. Debooo Bureau, 1985, Integrated circuits and semiconductor Devices - Theory and application, McGraw-Hill, New Delhi.

11. D. Roy Choudhury, 1991, Linear integrated circuits, Wiley Eastern, New Delhi.

12. Ramakant Gaekwad, 1991, Operational amplifiers, Wiley Eastern, New Delhi.

M.Sc in PHYSICS (FIRST SEMESTER)			
COURSE CODE: MSPA03	COURSE TYPE : ECCCB		
COURSE TITLE: CONDENSED MATTER PHYSICS - I			
CREDIT: 06 THEORY: 06		HOURS : 90 THEORY: 90	
MARKS : 100 THEORY: 70	CIA : 30		
OBJECTIVE: The main objective is to learn about Condensed Matter Physics .			
UNIT-1 20Hrs	Phase transformation and alloys: Equilibrium transformation of first and second order, equilibrium diagrams, phase rule. Interpretation of phase diagrams, substitutional solid solutions, Vegard's law, intermediate phases, Hume-Rothery rules, interstitial phases (carbides, nitrides, hydrides, borides). Martensitic transitions.		
UNIT-2 30Hrs	High temperature superconductors and GMR/CMR materials: High temperature superconductors, normal state properties (structural phase transition) of cuprates, phase separation and charge distribution into CuO2 planes, stripes phase, phase diagram, pseudogap, dependence of Tc on crystal structure, effect of impurities .GMR/CMR materials, Ruddlesden-Popper series of perovskites. Onset of ferromagnetism and metallic conduction. Double exchange.		
UNIT-3 30Hrs	Novel organic materials : Special carbon solids, fullerenes and tubules, formation and characterization of fullerenes and tubules. Single wall and multi wall carbon tubules. Electronic properties of tubules. Carbon nanotubule based electronic devices.		

UNIT-I (8 Hrs)	Polymers – amorphous polymers, glass transition temperature, effect of molecular architecture on glass transition temperature, free volume theory for glass transition, conducting polymers, optical band gap of polymers, electrical conduction in conducting polymers, mechanical and thermal properties of polymers, polymer blends and composites.
UNIT- II (8 Hrs)	Structural characterization and electron structure determination:Basic theory of X-ray diffraction, indexing of Debye-Scherrer patterns from powder samples, examples from some cubic and non-cubic symmetries. Neutron diffraction – basic interactions, cross section, scattering length and structure factor. Basic principles of X-ray absorption spectroscopy, photo emission and positron annihilation techniques. Qualitative discussion of experimental arrangement and of typical results for both simple as well as transition metals.
SUGGESTED READINGS	1. Andrei Maurachkine: Room temperature superconductivity, Cambridge International Science Publishing. 2. C.N.R. Rao: Colossal magnetoresistance, charge ordering and related properties of manganese oxide, Wspld Scientific, 1998 3. Polymer Physics by Ulf W. Gedde, Chapmann & Hall, 2001. 4. Introduction to Polymer Physics by David. I. Bower. 5. Polymer Science by J.R. Fried.

M.Sc. in PHYSICS (FIRST SEMESTER)		
COURSE CODE: MSPA04	COURSE TYPE : ECCNB	
COURSE TITLE: HIGH ENERGY PHYSICS I		
CREDIT: 06 THEORY: 06		HOURS : 90 THEORY: 90
MARKS : 100 THEORY: 70	CCA : 30	
OBJECTIVE: The main objective is to learn about High Energy Physics		
UNIT-1 20Hrs	Elementary particles and the fundamental forces. Quarks and leptons. The mediators of the electromagnetic, weak and strong interactions. Interaction of particles with matter, particle acceleration, and detection techniques. Symmetries and conservation laws.	
UNIT-2 20Hrs	Bound states. Discoveries and observations in experimental particle physics and relation to theoretical developments.	
UNIT-3 20Hrs	Symmetries, group theory, The group SU(2). Finite Symmetry Group. P and C, SU(2) of Isospin, The group SU(3)	
UNIT-4 15Hrs	Quark and Antiquark states: Mesons. Three quark states: Baryon, color factors. Asymptotic freedom. Charged and neutral weak interactions. Electroweak unification.	
UNIT- 5 15Hrs	Decay rates. Cross sections. Feynman diagrams. Introduction to Feynman integrals. The Dirac equation. Feynman rules for quantum electrodynamics (no derivation).	

SUGGESTED READINGS

1. Francis Halzen and Alan D. Martin, Quarks and Leptons: An Introductory Course in Modern Particle Physics, John Wiley and Sons
2. B.R. Martin and G. Shaw, Particle Physics, 2nd edition, J. Wiley and Sons (1997).
3. The Review of Particle Physics, Particle Data Group
4. David Griffiths, Introduction to Elementary Particles
5. Byron Roe Particle Physics at the New Millennium
6. Donald Perkins, Introduction to high energy physics.

Sant Gahira Guru Vishwavidyalaya, Sarguja, Ambikapur (C.G.)

M.Sc. (BOTANY) Syllabus (Choice Based Credit System)

(To be implemented from the Academic Year 2022-23)

SEMESTER-I

Course Code	Course Type	Course Title	Marks	Credits
MBT-101	CCC	MICROBIOLOGY	100	6
MBT-102	CCC	PHYCOLOGY	100	6
MBT-103	CCC	MYCOLOGY	100	6
MBT-104	OSC	RESEARCHMETHODOLOGY & COMPUTER APPLICATION : BACICS	100	6
MBT-105 (ELECTIVE PAPER)	ECC/CB	A 01- BRYOPHYTES AND PTERIDOPHYTES	100	6
	ECC/CB	A 02- ADVANCES IN ARCHEGONIATAE		
LBT-111	CCC	Based on papers MBT101 and MBT102	50	4
LBT-112	CCC & ECC	Based on papers MBT103 and MBT105	50	4

SEMESTER-II

Course Code	Course Type	Course Title	Marks	Credits
MBT-201	CCC	GYMNOSPERMS AND PALAEOBOTANY	100	6
MBT-202	CCC	ANGIOSPERMS: Taxonomy and Embryology	100	6
MBT-203	CCC	PLANT PHYSIOLOGY	100	6
MBT-204	PRJ/FST/EST	SOCIAL OUTREACH AND SKILL DEVELOPMENT	100	6
MBT-205 (ELECTIVE PAPER)	ECC/CB	B01- ENVIRONMENTAL BIOLOGY AND CONSERVATION	100	6
	ECC/CB	B02- ECOLOGY AND PHYTOGEOGRAPHY		
LBT-211	CCC	Based on papers MBT201 and MBT202	50	4
LBT-212	CCC & ECC	Based on papers MBT203 and MBT205	50	4

SEMESTER-III

Course Code	Course Type	Course Title	Marks	Credits
MBT-301	CCC	CELL BIOLOGY	100	6
MBT-302	CCC	GENETICS AND PLANT BREEDING	100	6
MBT-303	CCC	PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING	100	6
MBT-304	OSC	INTELLECTUAL PROPERTY, HUMAN RIGHTS & ENVIRONMENT : BASICS	100	6
MBT-305 (ELECTIVE PAPER)	ECC/CB	C01 - PLANT ANATOMY AND ECONOMIC BOTANY	100	6
	ECC/CB	C02 - DEVELOPMENTAL BIOLOGY		
	ECC/CB	C03 - BIOSTATISTICS		
LBT-311	CCC	Based on papers MBT301 and MBT302	50	4
LBT-312	CCC & ECC	Based on papers MBT303 and MBT305	50	4

SEMESTER-IV

Course Code	Course Type	Course Title	Marks	Credits
MBT-401	CCC	PLANT PHYSIOLOGY	100	6
MBT-402	CCC	PLANT PATHOLOGY	100	6
MBT-403	CCC	INSTRUMENTATION, MOLECULAR TECHNIQUES AND BIOINFORMATICS	100	6
MBT-404	SSC/PRJ	DISSERTATION	100	6
MBT-405 (ELECTIVE PAPER)	ECC/CB	D01 - ETHNOBOTANYAND CONSERVATION OF TRADITIONAL KNOWLEDGE	100	6
	ECC/CB	D02 - PLANT RESOURCE UTILIZATION AND CONSERVATION		
	ECC/CB	D03 -PLANT QUARANTINE		
LBT-411	CCC	Based on papers MBT401 and MBT402	50	4
LBT-412	CCC & ECC	Based on papers MBT403 and MBT405	50	4

SEMESTER-I

Course Code	Course Type	Course Title	Marks	Credits
MBT-101	CCC	MICROBIOLOGY	100	6
MBT-102	CCC	PHYCOLOGY	100	6
MBT-103	CCC	MYCOLOGY	100	6
MBT-104	OSC	RESEARCHMETHODOLOGY & COMPUTER APPLICATION : BACICS	100	6
MBT-105 (ELECTIVE PAPER)	ECC/CB	A 01- BRYOPHYTES AND PTERIDOPHYTES	100	6
	ECC/CB	A 02- ADVANCES IN ARCHEGONIATAE		
LBT-111	CCC	Based on papers MBT101 and MBT102	50	4
LBT-112	CCC & ECC	Based on papers MBT103 and MBT105	50	4

M.Sc. BOTANY			First Semester
COURSE CODE: MBT-101			COURSE TYPE: CCC
COURSE TITLE: MICROBIOLOGY			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	

OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Microbes.

UNIT – 1	A brief idea of microbial diversity; Principle of bacterial taxonomy, Bergey's manual. General account of Archaea, Actinomycetes and Mycoplasma
UNIT – 2	Types of microorganisms on the basis of mode of nutrition, symbiotic and non-symbiotic nitrogen fixation, *Rhizobium*-Legume symbiosis, Mycorrhiza
UNIT – 3	Genetics of Bacteria: Mechanism of Transformation, Conjugation and Transduction in bacteria. Role of microorganisms in agriculture and medicines
UNIT – 4	Viruses: General characters and classification; T even phages: Lytic cycle and its regulation; Lysogeny and its reglation in Lambda phage; Viroids and Prions
UNIT – 5	Different types of culture media; sterilization methods; Batch culture, Synchronous culture and Continuous culture methods. Bacterial growth curve and factors affecting growth rates

Suggested readings:

1. Madigan, M.T., Martinko, J.M., Dunlap, P.V., Clark, D.P., 2011. Brock Biology of Microorganiss. 13th edition, Pearson Education Inc.

2. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L., Painter, P.R., 1987. General Microbiology. Fifth edition. MacMillan.

3. Atlas, RM. 1995. Principles of Microbiology. Mobsy.

4. Lim, DV. 2003. Microbiology. Kendall/Hunt.

5. Boundless.2013. Microbiology. Boundless Learning, Incorporated.

6. Comelissen, CN, Harvey, RA and Fisher, BD. 2012. Microbiology. Lippincott Williams & Wilkins.

7. Talaro, K.P., Chess, B. 2011, Foundations in Microbiology. 8th edition. McGraw-Hill.

8. Willey, J.M., Sherwood, L., Woolverton, C.J., 2010. Prescott's Microbiology. 8th edition, McGraw-Hill.

9. Agrios, G. N., 1988. Plant Pathology, Academic Press.

10. John A Lucas, 1998. Plant Pathology and Plant Pathogens, Wiley-Blackwell, CRC Press.

11. Dickinson, C. M., 2003. Molecular Plant Pathology, Bios Scientific Publisher

12. Robert, N., Trigiano, Windham, M. T. and Windham, A.S., 2003. Plant Pathology: Concepts and Laboratory Exercises, CRC Press.

13. Bridge, P.D and Clarkson, J.M., 1998. Molecular Variability of Fungal Pathogens, CAB, International

14. Singh, R. S., 2008. Plant Diseases, Oxford and IBH Publishing Co. Pvt Ltd

15. Pelczar, JM, Chan, ECS and Krieg, MR. 1993. Microbiology. Tata McGraw Hill.

16.Prescott, Harley and Kleins. 2001. Microbiology, McGraw-Hill Education. USA.

M.Sc. BOTANY			First Semester
COURSE CODE: MBT-102			COURSE TYPE: CCC
COURSE TITLE: PHYCOLOGY			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Algae.			

UNIT – 1	General characters and classification of Algae; distribution and range of thallus organization, Cell ultra-structure,Pigment constitution, reproduction and life cycle patterns
UNIT – 2	Algae of diverse habitats, algal blooms, phycoviruses and algae in human welfare(algal biofertilizers, algae as food and feed, industrial uses of algae),Techniques of algal culture,
UNIT – 3	Cyanophyta: Thallus organization and reproduction, cell structure, heterocyst and akinete development, chromatic adaptation
UNIT – 4	Thallus organization and reproduction in Chlorophyta, Phaeophyta and Rhodophyta
UNIT – 5	A brief account of Prochlorophyta, Euglenophyta, Eustigmatophyta, Prasinophyta, Xanthophyta, Chrysophyta, Bacillariophyta and Pyrrophyta

Suggested Readings:

1. Hoek, CVD & Chapman, DG (1995). Algae: An Introduction to Phycology, Cambridge University Press, Cambridge
2. Fritsch, FE (1935, 1948). The Structure and Reproduction in Algae, Vol I & II, Cambridge University Press, Cambridge
3. Round, FE (1986). The Biology of Algae, Cambridge University Press, U.K.
4. Bold, HC & Wynne, J (1985). Introduction to Algae: Structure and Reproduction, , 2nd Edition, Prentice-Hall Inc.
5. Lee, RE (2008). Phycology, Fourth edition, Cambridge University Press
6. South, GR & Whittick, A (1998). Introduction to Phyclogy, Blackwell Scientific Publication
7. Vashistha, BR, Sinha, AK & Singh, NP (2013). Algae, Botany for Degree Students, S. Chand, New Delhi.
8. Round, FE (1984). The Ecology of algae, Cambridge University Press, New Delhi.

9. Sharma, OP (2006). Textbook of Algae, Tata McGraw Hill, New Delhi

M.Sc. BOTANY			First Semester
COURSE CODE: MBT-103			COURSE TYPE: CCC
COURSE TITLE: MYCOLOGY			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Fungi.			
UNIT – 1	General characteristics of Fungi; Principles of classification and mode of nutrition; Distribution and economic importance of fungi. Heterothallism and Parasexuality in fungi		
UNIT – 2	General account of Myxomycotina. Mastigomycotina: A brief description of Chytridiales, Blastocladiales, Saprolegniales and Peronosporales		
UNIT – 3	Zygomycotina: Mucorales and Entomophthroles; Ascomycotina: Endomycetales, Protomycetales, Taphrinales, Eurotiales, Erysiphales, Spaeriales and Pezizales		
UNIT – 4	Basidiomycotina: Uredinales, Ustilaginales, Lycoperdales, Nidulariales, Sclerodermatales, Phallales and Agaricales		
UNIT – 5	Deuteromycotina: Sphaeropsidales, Melanconiales and Mycelia sterilia Lichens: General characteristics, thallus structure, reproduction and economic importance,		

Suggested Readings:

1. Alexopoulos, CJ, Mims, CW & Blackwell, M (1996). Introductory Mycology, John Wiley Publications, UK.
2. Mehrotra, RS & Aneja KR, An Introduction to Myocology. New Age InternationalPublishers. New Delhi.
3. Webster, J. 2007. An Introduction to Fungi. Cambridge Univ. Press. New Delhi.
4. Hale, M.E. (1983), The biology of lichens (3rd ed.). Edward Arnold.
5. Hawksworth, DL & Hill, DJ 1984: The Lichen-Forming Fungi. - Blackie, Glasgow and London. 158 pp
6. Galun, M. (ed.) (1988) CRC Handbook of Lichenology. Volume III. - CRC Press, Inc., Boca Raton
7. Brown D. H., Hawksworth D. L. & Bailey R. H. 1976, Lichenology: Progress & problems, Academic Press. London.

M.Sc. BOTANY			First Semester
COURSE CODE: MBT-104			COURSE TYPE: OSC
COURSE TITLE: RESEARCH METHODOLOGY & COMPUTER APPLICATION: BASICS			
CREDIT: 6		HOURSE: 90	
THEORY: 6		THEORY: 90	
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 00	

OBJECTIVES:

-Understands the concept and place of research in concern subject.

-Gets acquainted with various resources for research.

-Becomes familiar with various tools research.

-Gets conversant with sampling techniques, methods of research and techniques of analysis of data.

-Achieves skills in various research writings.

-Gets acquainted with computer fundamentals and office software package.

UNIT – 1	CONCEPT OF RESEARCH: Meaning and characteristics of research, Steps in research process, Types of research; i) Basic, applied and action research ii)Quantitative and qualitative research, area of research in concern discipline. SELECTION OF PROBLEM FOR RESEARCH: Sources and criteria of the selection of the problem, Drafting of research proposal, Meaning and types of variables, Meaning and types of hypothesis.
UNIT – 2	TOOLS OF RESEARCH: Construction procedure of (i) Questionnair, (ii) Interview, (iii) Psychological test, (iv) Observation, (v) Rating scale, (vi) Attitute scale, (vii) Check list, Advantages and disadvantages of above tools. SAMPLING: Meaning of population and sample, Importance and characteristics of sample, Sampling techniques- i) Probability sampling; random sampling, stratified random sampling, systematic sampling, cluster sampling, ii) Non – probability sampling; incidental sampling, purposive sampling, quata sampling.
UNIT – 3	METHODS OF RESEARCH: Meaning and conducting procedure of following methods of research : Historical method, Survey method, Case study, Casual comparative method, Developmental methods, Experimental methods.
UNIT – 4	TREATMENT OF DATA : Level of measurements of data, Steps in measurement of data; editing, coding, classification, tabulation, analysis and interpretation of results. WRITING RESEARCH REPORT : Sections of report; preliminary section, Content section; various chapters, Supplimentary section; appendices,references, abstract, abbreviations, format and style.

UNIT – 5	COMPUTER FUNDAMENTALS : Computer system; Features, generations and basic applications of computers. Parts of computer system: block diagram, central processing unit (CPU); Concepts and types of Hardware & software, Input devices: Mouse, Keyboard, Scanner, Bar code reader, Trac ball; Output devices: Monitor, Printer, Plotter, Speaker; Computer memory – primary and secondary memory, magnetic and optical storage devices. Operating Systems – MS Windows: basics of window OS; Components of windows – icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders; Control Panel: display properties, adding and removing software and hardware, setting date and time, screensaver and appearance; Windows Accessories: Calculator, Notepad, Wordpad, Paint Brush, Commond prompt, windows explorer.
UNIT - 6	Office Software Package : - Word Processing- MS Word : Creating, Saving, Opening, Editing, Formatting, Page setup and Printing documents; Using tables, pictures and charts in documents; Using Mail Merge sending a document to a group of people and creating form, letters and lable. Spreadsheet – MS Excel : Opening a blank or new workbook, entering data/function/formula into worksheet cell, saving, editing, formatting, Page setup and printing workbooks. Presentation Software – MS Power point : Creating and enhancing a presentation, modifying a presentation, working with visual elements, adding animations & transitions and delivering a presentation.

SUGGESTED READINGS:

Agrawal, Y. P. (1988). Better Sampling : Concepts, Techniques and Evaluation. New Delhi: Sterling publishers Private Limited .

Best, J. W. (1993) Research in education (6th ed.) New Delhi : Prentice-Hall of India Pvt.Ltd.

Broota K. D. (1992) Experimental Design in Behavioral Research (2nd ed.) New Delhi : Wiley Eastern Limited.

Dasgupta A. K. (1968) Methodology of Economic research. Bombay – Asia Publishing House.

Edwards, A. L. (1957) Techniques of Attitude scale Construction. New York : Appleton-Contury.

Kothari, C.R. (3rd ed.) Research Methodology : Methods and Techniques, New Age International Publishers.

Singh Y.K. (2021), Fundamental of Research Methodology and Statistics, New Age International Publishers.

Dr. P. Mohan, Fundamentals of Computers, Himalaya Publishing House.

M.Sc. BOTANY			First Semester
COURSE CODE: MBT-105 : A01			COURSE TYPE: ECC/CB
COURSE TITLE: BRYOPHYTES AND PTERIDOPHYTES			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of BRYOPHYTES AND PTERIDOPHYTES			

UNIT – 1	Bryophyta: General account, classification and origin of Bryophytes; evolution of sporophyte; fossil Bryophytes, Affinities of Bryophytes with Algae and Pteridophytes,
UNIT – 2	Comparative account of the gametophytes and sporophytes of Hepaticopsida, Anthocerotopsida and Bryopsida. Peristome structure and its significance in the classification of Mosses.
UNIT – 3	General characters and classification of Pteridophytes and their economic importance. Evolution of vascular system in plants, Stellar system, Telome theory, Apogamy and Apospory, Heterospory and seed habit, Affinities of Pteridophytes with Gymnosperms,
UNIT – 4	Study of Early vascular plants: Rhyniophyta, Trimerophytophyta, Zosterophylophyta, *Lepidodendron, Lyginopteris.*
UNIT – 5	Comparative morphology and anatomy of gametophytes and sporophytes of Psilopsida, Lycopsida, Sphenopsida and Filicopsida.

Suggested Readings :

1. Gangulee, H.C. and Kar, A.K., 2011, College Botany Vol. II (Algae+Fungi+Brophyta+Pteridophyta) , New Central Book Agency, Kolkata
2. Singh, Pande, Jain, 2010, A Text Book of Botany (Algae+Fungi+Brophyta+Pteridophyta) , Pub. Rastogi Publication, Meerut
3. Parihar N. S. 1965, An Introduction to Embyophyta- Bryophyta. Central Book Depot. Allahabad.
4. Kashyap S. R. 1972, Liverworts of the Western Himalayas & the Punjab Plains. Part 1 & 2.
5. Richardson D. H. S, The Biology of Mosses.
6. Janice. M. Glime, 2006, Bryophyte Ecology.
7. Goffinet B. & Shaw. A. J. 2008, Bryophyte Biology.
8. Rashid, A, 2011, An Introduction to Pteridopyta, 2nd edition, (Reprint), Pub. Vikas Publishing House Pvt. Ltd., Noida.

9. Gifford, Ernest, M., Foster, Adriance.S., 1989, Morphology and Evolution of vascular plant. W. H. Freeman; Third Edition.
10. Ogura, Yuzuru., 1972, Comparative Anatomy of Vegetative Organs of The Pteridophytes. Gebr. Borntraeger; 2nd edition.
11. Rashid, A.1999, An Introduction to Pteridophta: Diversity,Development,Differentiation. Vikas Publishing House Pvt Ltd.
12. Parihar, Narayan Singh., 1977, The Biology and Morphology of The Pteridophyte. Central Book Depot.

M.Sc. BOTANY			First Semester
COURSE CODE: MBT-105 : A02			COURSE TYPE: ECC/CB
COURSE TITLE: ADVANCES IN ARCHEGONIATAE			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Bryophytes & Pteridophytes.			
UNIT – 1	Bryophytes : Vegetative and reproductive innovations of earlyland plants, Role of bryophytes in ecosystem dynamics and in the global carbon budget, bryophytes association with microorganism and animals, Symbiotic fungal associations in early land plants.		
UNIT – 2	Poikelohydry, Desication tolerance. Bryogeography and conservation. Hormonal regulation of gametophyte developmentin bryophytes. Breeding system, population ecology and population genetics, Anisospory and sexual dimorphism. Biologically active compounds in Bryophytes. Cytogenetics of bryophytes, Molecular genetics studies of moss species.		
UNIT – 3	Pteridophytes : Morphological diversity and evolution of vegetative organs in Pteridophytes, Diversity of ferns- an ecological perspective, Genetics and reproductive biology of ferns, Culture of fern gametophyte for experimental investigation, Photomorphogenesis, Model System in Ceratopteris, Osmunda, Marsilea.		
UNIT – 4	Gymnosperms : Evolution of pollination mechanisms and embryogeny of gymnosperms, Propagation of conifers using plant tissue culture approaches, advances in synthetic seeds technology of conifers, somatic embryogenesis and plantlet regeneration;		
UNIT – 5	Diversity of non living gymnosperms, morphological diversity and reproductive variations in cycadales, ginkgoales, coniferales and gnetales. Origin of vascular system in coniferales. Conifer plantation, uses and impact of coniferous forest on human life.		

Suggested Readings :

1. Shaw A.J. and B. Goffinet (2000) Bryophyte Biology, Cambridge University Press.
2. Geissler and Greene SW (1982) Bryophyte Taxonomy, Methods, Practices and floristic exploration, J Cramer, Germany.
3. Dyer AF (Ed) (1979) The experimental biology of ferns. Academic London.
4. Richardson DHS (1981) The Biology of mosses. John Wiley & Sons, Inc New York.
5. Bhatnagar SP and Moitra A (1996) Gymnosperms. New Age International (P) Limited, Publishers, New Delhi.
6. Singh Hardev (1978) Embryology of Gymnosperms. Encyclopedia of Plant Anatomy. Vol. X Gebruder Borntraegrl, Berlin, Stuttgart.

LBT111: Based on papers MBT101 and MBT102
LBT112: Based on papers MBT103 and MBT105

SEMESTER-II

Course Code	Course Type	Course Title	Marks	Credits
MBT-201	CCC	GYMNOSPERMS AND PALAEOBOTANY	100	6
MBT-202	CCC	ANGIOSPERMS: Taxonomy and Embryology	100	6
MBT-203	CCC	PLANT PHYSIOLOGY	100	6
MBT-204	PRJ/FST/EST	SOCIAL OUTREACH AND SKILL DEVELOPMENT	100	6
MBT-205 (ELECTIVE PAPER)	ECC/CB	B01- ENVIRONMENTAL BIOLOGY AND CONSERVATION	100	6
	ECC/CB	B02- ECOLOGY AND PHYTOGEOGRAPHY		
LBT-211	CCC	Based on papers MBT201 and MBT202	50	4
LBT-212	CCC & ECC	Based on papers MBT203 and MBT205	50	4

M.Sc. BOTANY			**Second Semester**
COURSE CODE: MBT-201			COURSE TYPE: CCC
COURSE TITLE: **GYMNOSPERMS AND PALAEOBOTANY**			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Gymnosperms and Fossil Plants.			
UNIT – 1	General introduction of gymnosperms with special reference to its salient features, similarities and dissimilarities with other groups like pteridophytes and angiosperms. Classifications of gymnosperms. Origin and Evolution of gymnosperms with special reference to Progymnosperms, Devonien pre ovules and origin of seed.		
UNIT – 2	Comparative morphology, anatomy, reproductive biology and phylogenetic studies of the following groups: Pteridospermopsida-Lyginopteridales, Medullosales, Callistophytales, Glossopteridales, Peltaspermales Corystospermales and Caytoniales. Cycadopsida, Pentoxylopsida, Bennettiopsida, Ginkgopsida Coniferopsida and Gnetopsida.		
UNIT – 3	Global distribution of gymnosperms with special reference to Indian plants. Endangered gymnosperms, their conservation and present status. Cytogenetics of Gymnosperms; Economic importance and biotechnology of gymnosperms.		
UNIT – 4	Basic geological information – structure of Earth, Types of rocks, stratigraphy,		

	basic concepts of continental drift and plate tectonics. Dating the past, Geological time scale. Fossilization process, Types of fossils, including chemical fossils and fossil techniques to study fossils, reconstruction and nomenclature of fossil, concepts of Parataxa and Eutaxa, objectives of palaeobotany. Prebiotic Environment, chemical evolution and origin of life, Pre-Cambrian life. Indian Pre-cambrain stratigraphy and life forms.
UNIT – 5	Applied Palaeobotany Life as fuel maker, sources of natural fossil fuels, Peat, coal and its varieties, constitution of coal, Coal Palynology, coal maceral, Petroleum – its origin, Palynology in oil exploration. Fundamentals of Paleofloristics, Palaeogeography and Palaeoclimatology. Applicaion of Palaeopalynology .Plant and animal interactions correlation Archaeobotany with special reference to phytoliths and palynological studies.

Suggested readings:

1. Eames, A.J. (1936) Morphology of Vascular plant-lower group. Tata Mc Graw Hill, New Delhi.
2. Chamberlain, Charles Joseph, b.(1863), Gymnosperm; Structure and Evolution. Chicago, III., The University of Chicago Press
3. Chhaya Biswas and B.M.Johri. The Gymnosperm. Springer; 1997, edition (16 April 2014)
4. Bhatnagar, S.P. Moitra, Alok. (1996). Gymnosperms. New Age International.
5. Pant DD. (2002), An Introduction to Gymnosperms, Cycas, and Cycadales, Birbal Sahni Institute of Palaeobotany.
6. Steward W.N., Palaeobotany and evolution of plant. Cambridge University Press, New York.405 p.(1)
7. Stewart,W.N.,and G.W.Rothwell.(1993) Palaeobotany and the evolution of plant. 2nd ed. Cambridge University Press, New York.521 p.(1)
8. Andrews ,H.N.,jr.1974 Palaeobotany (1947-1972) Annals of the Missouri Botanical Garden 61:179-202.(8) Page **7** of **21**
9. Thomas N.Taylor.Edith L. Tailor.Michael Krings (2009) Palaeobotany: The biology and Evolution of Fossil Plants Amsterdam ; Boston, Mass. : Academic Press, c2009
10. Wilson N Stewart and Gar W. Rothwell - 1993. Palaeobotany and the evolution of plants. Cambridge university press.
11. Edith L. Taylor, Thomas N. Taylor, Michael Krings – 2009. Palaeobotany: The Biology and Evolution of Fossil Plants. Academic Press.

M.Sc. BOTANY			Second Semester
COURSE CODE: MBT-202			COURSE TYPE: CCC
COURSE TITLE: **ANGIOSPERMS: Taxonomy and Embryology**			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of identification, importance and applications of Higher Plants .			
UNIT – 1	Taxonomic Principles, Botanical nomenclature: Binomial system, ICBN rules and recommendations, Priority, Typification, rules of effective and valid publications. Outline of classification proposed by Bentham and Hooker and Hutchinson, Takhtajan, Cronquist,		
UNIT – 2	Taxonomic features and economic importance of following families: Magnoliaceae, Ranunculaceae, Papaveraceae, Capparidaceae, Brassicaceae, Caryophyllaceae, Malvaceae, Rutaceae, Meliaceae, Leguminosae, Rosaceae, Combretaceae, Cucurbitaceae, Umbelliferae, Rubiaceae, Asteraceae, Asclepiadaceae, Apocyanaceae, Convolvulaceae, Solanaceae, Scrophulariaceae, Acanthaceae, Lamiaceae, Verbenaceae, Polygonaceae, Euphorbiaceae, Orchidaceae, Zingiberaceae, Araceae, Liliaceae, Cyperaceae and Poaceae		
UNIT – 3	Numerical Taxonomy: Aims and objectives, merits and demerits; Chemotaxonomy: Role of phytochemicals in taxonomy; Morphology, Anatomy, Embryology and Cytology in relation to taxonomy;		
UNIT – 4	Structure of a typical flower; Anther and Microsporangium, Microsporogenesis, pollen wall features, development of male gametophyte; Megasporangium: Types of ovules, structure of ovule, Megasporogenesis, development of female gametophyte, types of embryo sacs. Pollination: Definition, types and agencies of pollination; Pollen - pistil interaction, fertilization and Double fertilization; Endosperm: types and development; Embryogeny; Sexual incompatibility		
UNIT – 5	Experimental Embryology: Tissue culture, Apomixis, haploid production, Androgenesis, Gynogenesis, Embryo culture, Ovule and seed culture, Parthenocarpy, Synthetic seed production		

Suggested readings:

1. Sambamurty, A.V. S. S. 2005. *Taxonomy of Angiosperms*. I. K. International Pvt. Ltd., New Delhi.

2. APG III 2009. An update of the Angiosperm Phylogeny Group Classification for the Orders and Families of Flowering Plants: APG III. *Bot. J. Linn. Soc.* 161: 105-121.

3. Bhattacharyya, B. and B. M. Johri. 1998. Flowering Plants - Taxonomy and Phylogeny. Narosa Publishing House, New Delhi.

4. Heywood, V. H. and Moore, D. M. 1984. Current Concepts in Plant Taxonomy. Oxford University Press.

5. Duthie, J. F. "*Flora of upper gangetic plain and of the adjacent siwalik & sub-himalayan tracts*," Calcutta, Vol. 3, No. 1, 1915.

6. Jain, S.K. and Rao, R.R. 1977. *A Handbook of Field and Herbarium Methods*. Today and Tomorrow's Printers and Publishers, New Delhi-

7. Rao, R. R. 1994. *Biodiversity in India* (Plant Aspects), Bishan Singh Mahandrapal Singh, Dehradun.

8. Sharma, O. P. 1993. *Plant Taxonomy*. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

9. Singh, V. & Jain, D.K. 2006. Taxonomy of Angiosperms. : Rastogi Publications, Meerut.

10. Singh, Gurcharan 2012. Plant Systematics: An Integrated Approach- Science Publishers, Enfield, (3rd edn.)

11. Stace, C. A. 1989. Plant Taxonomy and Biosystematics. University Park Place, Baltimore (2nd edn.)

12. Takhtajan A. 2009. *Diversity and classification of flowering plants*, 2nd edn. Berlin: Springer.

13. Verma, B. K. 2010. *An introduction to Taxonomy of Angiosperms*. PHI Learning Pvt. Ltd. New Delhi.

14. Jones, SB Jr. and Luchsinger, AE. 1986. Plant Systematics (2nd edition). McGraw Hill Book Co., New York.

15. Pandey, A. K., J.V.V. Dogra & Wen, J. 2006. Plant Taxonomy: Advances and Relevance. CBS Publishers & Distributors Pvt. Ltd.

16. Subrahmanyam, N. S. Taxonomy of Angiosperm, Vikas publishing house Pvt Ltd.

17. Pullaih, T. 2007. Taxonomy of angiosperm. Regency publications, New Delhi.

18. Bhojwani, S.S. and Bhatnagar, S.P.(1985), Embryology of Angiosperms, Vikash Publishing House, New Delhi

19. Johri, B.M (1984) Embryology of Angiosperms.Springer-Verlog Berlin Heidelberg.

20. Maheshwari, P. (1950) An Introduction to the Embryology of Angiosperms.Tata McGraw Hill.

21. Pandey, B.P., Angiosperms-Taxonomy, Emrbyology and Anatomy, S. Chand and Co., New Delhi

22. Bhojwani, S.S. and Bhatnagar, S.P., Embryology of Angiosperms, Vikash Publishing House, New Delhi

23. Butenko RG (2000) Plant Cell Culture, University Press of Pacific.

24. Davies PJ (2004) Plant Hormones, Kluwer Academic Publishers, Netherlands.

25. Halford N (2006) Plant Biotechnology - Current and future applications of genetically modified crops, John Wiley and Sons, England.

M.Sc. BOTANY			Second Semester
COURSE CODE: MBT-203			COURSE TYPE: CCC
COURSE TITLE: PLANT PHYSIOLOGY			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Life Processes of Plants.			
UNIT – 1	Water relations: Properties of water, Water potential, Osmosis, Diffusion, Osmotic Pressure, Diffusion Pressure Deficit (DPD), Absorption of water and minerals, Mechanism of water and mineral absorption Phloem transport: Loading and unloading of photosynthate, theories of phloem transport		
UNIT – 2	Photosynthesis: Photosynthetic pigments, absorption of light, absorption spectra, Light harvesting Complex (LHC), Z- Scheme, Photo-oxidation of water, carbon assimilation pathways-C3, C4 and CAM, Photorespiration		
UNIT – 3	Respiration: Glycolysis, TCA cycle, ETS, ATP synthesis, Pentose phosphate pathway, alternative oxidase system		
UNIT – 4	Plant Growth Regulators: Physiological effects and mechanism of action of plant growth hormones (Auxin, Gibberellins, Cytokinins, ABA, Ethylene and Brassinosteroids), hormone receptors, signal transduction and gene expression		
UNIT – 5	Sensory Photobiology: Structure and function of Phytochrome Cryptochrome and Phototropins; Molecular mechanism of phytochrome action. The Flowering Process: Photoperiodism and its significance, endogenous clock and its regulation, flowering stimulus, florigen concept and vernalization		

Suggested readings:

1. Taiz and Zeiger, 2010, Plant Physiology, 5th Edition , Sinurer Associates
2. Hopkins, W.G. and Huner N.P.A., 2009, Introduction to Plant Physiology, 4th Edition Wiley International Edition, John Wiley & Sons, USA
3. Jones, Russell L. Buchanan, Bob B. Guissem, Wilhelm., 2002, Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists.
4. Peter Scott, Physiology and Behaviour of Plants. Wiley-Blackwell.
5. Frank Boyer Salisbury and Cleon Ross, 1991, Plant Physiology, CA

MBT-204	PRJ/FST/EST	SOCIAL OUTREACH AND SKILL DEVELOPMENT

M.Sc. BOTANY			Fourth Semester
COURSE CODE: MBT-205: B01			COURSE TYPE: ECC/CB
COURSE TITLE: ENVIRONMENTAL BIOLOGY AND CONSERVATION			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Microbes.			
UNIT – 1	Gaseous and particulate pollutants, indoor air pollution, Effects of important air pollutants on plants, human health and ecosystems.		
UNIT – 2	Photochemical smog, stratospheric ozone depletion; effects of enhanced UV-B on plants, microbes and human health. Acid rain: Formation, dispersion and deposition; consequences on soil fertility, rivers, lakes and plants,		
UNIT – 3	Greenhouse effects: consequences, global warming, sea level rise, albedo, oceanic influences; effects of increased CO2 on plants; human implications. Surface cooling		
UNIT – 4	Sources of water pollution, Physico-chemical and biological properties of sewage, industrial effluents produced from textile, leather, thermal power, chemical, and mining industries and their effects on water quality, bio-indicators of water pollution.		
UNIT – 5	Biodiversity: Definition, magnitude and global pattern of Biodiversity, Hypothesis related to global patterns of biodiversity, regional pattern of biodiversity; Biodiversity of Hot Spots, Threats to Biodiversity; Extinction of species, IUCN Red list categories; Conservation Strategies: ex situ and in situ conservation; India's biodiversity and its conservation		

Suggested Readings:

1. Adger, W. N. 2005. Adapting to climate change**.** Wiley Publication. UK.
2. Arthur, C. Stern. 1997. Fundamentals of air pollution, Wiley Publishers, UK.
3. Arya Arun. 2009. Eco-degradation due to air pollution. Narosa Publishers. New Delhi
4. Bell and Treshow 2002. Air Pollution and Plant Life. Willey Publication. UK.
5. Kenneth, Wark. 1997. Air Pollution its origin and control, Prentice Hall publication.UK
6. Pepper, Ian. 2003. Environmental chemistry. Wiley Publication. UK.
7. Sharma, P. D. 2006. Ecology and Environment. Rastogi Publication, Meerut.

8. Singh, J.S. Singh, S.P. and Gupta, S.R. 2008. Ecology Environment and Resource Conservation. Anamaya Publishers. New Delhi.
9. Agrawal S.K., 2009. Water Pollution. APH Publishing House. New Delhi.
10. Goel P.K., 2006. Water Pollution. New Age International. New Delhi.
11. Henze M., Harremoës P., Jansen, and Arvin, E., 2002. Wastewater Treatment: Biological and Chemical processes, Springer Publication. Germany.
12. Marcos von Sperling, 2007. Basic Principles of Wastewater Treatment: IWA Publishing Company. UK.
13. Wang Lawrence. 2009. Handbook of advanced industrial and hazardous wastes treatment. CRC Press. UK.
14. Wun Jern Ng. 2006. Industrial Waste water Treatment. Imperial College Press. UK.

M.Sc. BOTANY			Second Semester
COURSE CODE: MBT-205 : B02			COURSE TYPE: ECC/CB
COURSE TITLE: ECOLOGY AND PHYTOGEOGRAPHY			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance, distribution and applications of Plants for healthy environment.			
UNIT – 1	Introduction to ecology, and environmental terminology, population dynamics, population characteristics, population growth forms, density dependent and density independent controls, population structure (distribution, aggregation, isolation territoriality) energy partitioning , r - and k-selection, concept of carrying capacity; Wild life sanctuaries, botanical gardens		
UNIT – 2	Vegetation organization and characteristics: Concepts of Community and Continuum; Community coefficients, interspecific associations, ordination, Ecological Niches, Species diversity (alpha, beta and gama).		
UNIT – 3	Ecosystem: Structure and function, Primary productivity, Trophic organization, Energy flow pathways, Ecological coefficients; Mechanism of Decomposition and its control; Nutrient cycling in ecosystem, Eutorphication, BOD		
UNIT – 4	Ecosystem stability (resistance and resilience), ecological perturbation (natural and anthropogenic) and their impact on plants and ecosystems; Plant invasion Ecological Succession: Modes and mechanism; Xerarch and Hydrarch		
UNIT – 5	Phytogeography: Definition and scope, Endemism, factors governing distribution of plants, phytogeographical regions of India, plants endemic to Indian subcontinent, Major biomes.		

Suggested reading:

1. Odum, E. P. and Barret G.W. 2005. Fundamentals of Ecology. Cengage publication
2. Singh, J.S., Singh S.P. and Gupta S.R. 2006. Ecology Environment and Resource Conservation. Anamaya Publishers
3. Kormondy E. J., 2000. Concept of Ecology. 4th Edition. Benzamin Cummings. UK
4. Odum E.P., 1996. Fundamentals of Ecology, Natraj Publishers, Dehradun.
5. Patrick L. 2000. Tropical Ecosystems and Ecological Concepts. Cambridge University Press. UK.
6. Sharma P.D. 2007. Ecology and Environment. Rastogi Publication, Meerut.
7. Singh J.S., S.P. Singh and S.R. Gupta 2006. Ecology, Environment and Resource Conservation, S. Chand Publication, New Delhi.

LBT211: Based on papers MBT201 and MBT202

LBT212: Based on papers MBT203 and MBT205

SEMESTER-III

Course Code	Course Type	Course Title	Marks	Credits
MBT-301	CCC	CELL BIOLOGY	100	6
MBT-302	CCC	GENETICS AND PLANT BREEDING	100	6
MBT-303	CCC	PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING	100	6
MBT-304	OSC	INTELLECTUAL PROPERTY, HUMAN RIGHTS & ENVIRONMENT : BASICS	100	6
MBT-305 (ELECTIVE PAPER)	ECC/CB	C01 - PLANT ANATOMY AND ECONOMIC BOTANY	100	6
	ECC/CB	C02 - DEVELOPMENTAL BIOLOGY		
	ECC/CB	C03 - BIOSTATISTICS		
LBT-311	CCC	Based on papers MBT301 and MBT302	50	4
LBT-312	CCC & ECC	Based on papers MBT303 and MBT305	50	4

M.Sc. BOTANY			Third Semester
COURSE CODE: MBT-301			COURSE TYPE: CCC
COURSE TITLE: CELL BIOLOGY			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Cells and Plant Science.			
UNIT – 1	Structural organization of typical plant cell; Structure of cell wall and its biogenesis; Plasma membrane; Cell organelles: Structure and function, nuclear envelope, Nuclear pore complex (NPC), Nucleolus: structure and function		
UNIT – 2	Cell cycle: control mechanism, role of cyclins and cyclin dependent kinesis. Study of different types of cell divisions; Cell-cell interaction and signaling: signaling molecules and mechanism of signaling, secondary messenger, Ca+, c-AMP, MAP kinase		
UNIT – 3	Chromatin organization and replication: Chromosome structure and types, Nucleosome organization, assembly and disassembly of histones during replication; Karyotype analysis, chromosome banding patterns: types of chromosome banding, uses of chromosome banding in cytogenetics; Special types of chromosomes,		
UNIT – 4	RNA structure and types,DNA structure and types Replication of DNA, semiconservative mode of replication, DNA polymerases, Centarl dogma, Genetic codes, transcription and translation in prokaryotes and eukaryotes; Regulation of gene expression in prokaryotes and eukaryotes.		
UNIT – 5	Cellular differentiation and specialization, Molecular mechanisms of cellular differentiation, Cell senescence and death; Programmed cell death-necessity, classes, signals; Cell apoptosis		

Suggested Readings:

1. Alberts B. Johnson, A. Lewis, J. Raff, M. Roberts, K. Walter, P. 2008. Molecular Biology of the Cell. Garland Science Publisher. USA.
2. Berg, J M; Stryer L. 2010. Biochemistry, W. H. Freeman; Seventh Edition edition
3.De Robertis and De Robertis. 2010. Cell and Molecular Biology: Saunders College Publisher. UK.
4. Lewin Benzamin 2011. Gene X: Jones and Bartlett Learning Publisher. USA.
5. Lodish and Baltimore.2005. Molecular Cell Biology: WH Freeman Publisher. UK.
6. Nelson and Cox. 2002. Lehninger Principle of Biochemistry: 3rd Edition: WH Freeman Publisher. UK.

M.Sc. BOTANY			Third Semester
COURSE CODE: MBT-302			COURSE TYPE: CCC
COURSE TITLE: GENETICS AND PLANT BREEDING			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Genetics of Plants & Breeding in Plants.			
UNIT – 1	Mendelian Inheritance: Segregation and Independent assortment; Incomplete dominance, Co-dominance, Gene interactions, Epistasis, Chromosomal theory of inheritance, Sex chromosomes and determination, Dosage compensation, Extra nuclear inheritance		
UNIT – 2	Linkage and recombination, Crossing over, Chromosome mapping, Structure of genetic material, Chromosomal aberrations: Structure and numerical changes in chromosomes- Deletion, Duplication, Translocation, Aneuploidy and Euploidy, Gene mutation		
UNIT – 3	Population Genetics: Population models, probability and distributions, Genotypic and phenotypic variations, Hardy- Weinberg measures of genetic variation, Gene frequencies and equilibrium, Optimum phenotype and selection pressure, kinds of selection, Fischer's fundamental theorem of natural selection		
UNIT – 4	Genomics and Molecular Genetics: Maps of chromosomes, Map position- based cloning of genes, Chromosome walks, Chromosome jumps, Expressed sequences, Comparative genomics: Mitochondrial and Chloroplast genomes		
UNIT – 5	Plant Breeding: Objective and scope, Hybridization in self pollinated and cross pollinated crops, Inbreeding depression and Heterosis, Polyploid breeding, Breeding for disease resistance plants, Molecular Markers and plant breeding		

Suggested reading:

1. Clark, M.S. and Wall, W.J. 1996, Chromosomes : The Complex Code. Chapman & Hall, London.

2. Stebbins, G.L.1950, Variation and Evolution in Plants. Columbia Univ. Press, New York.

3. Swanson, C. P., Mertz, T.F. and Young, W.J. Cytogenetics : The Chromosomes in Division, Inheritance and Evolution (2nd Edn). Englewood Cliff, Prentice-Hall, New Jersey.

4. Sharma, A.K. and Sharma, Archana. 1985. Advances in Chromosome and Cell Genetics. Oxford & IBH Publishing Co., Calcutta.

5. Schnedl, W.. Banding patterns in chromosomes. In: International Review of Cytology (Suppl.4).

6. Lewine, Benjamin, Jones and Bartlet, Genes X, Sudburry, Masschusetts

7. Gupta, P.K., Cytogenetics, Rastogi Publication, Meerut

8. Peter, D, Snustand and Simmons, M.J., John Wiley and Sons Inc.

M.Sc. BOTANY			Third Semester
COURSE CODE: MBT-303			COURSE TYPE: CCC
COURSE TITLE: PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Plant Biotechnology & GMOs.			
UNIT – 1	Basic concepts of Biotechnology, biotechnology and its components, need of R and D and pilot scale production using biotechnology, current global scenario, fermentation technology, environmental biotechnologies, biosensors, phytoremediation, biotechnology and information technology (BT and IT) interdependence, management of biotech related industries		
UNIT – 2	Introduction of plant tissue culture and cell suspension culture, physic chemical conditions for propagation of plant cells and tissues, composition of media nutrient and hormone requirement, single cell culture, somaclonal variation, protoplast isolation and hybridization; concept of artificial seeds.		
UNIT – 3	Methods for the plant genetic transformation, particle bombardment method,electroporation, microinjection, mechanism of Agrobacterium mediated gene transformation		
UNIT – 4	Promoters and genetic markers, transgenic plant analysis, biosafety related issues to transgenics, field trials and risk management, intellectual property rights.		
UNIT – 5	GMO case study, GM crops, Transgenics plant resistant to biotic and abiotic stresses, molecular techniques for marker free transgenics.		

Suggested Readings:

1. Brown T.A. 2007. Genomes 3. Garland Science Publication. USA.
2. Brown.T.A.2011. Gene Cloning and DNA Analysis. Taylor and Francis. UK.
3. Karp, G. 2009. Cell and Molecular Biology Concepts and Experiments. Willey Publication. UK.
4. Primrose and Twyman, 2009. Principles of Gene manipulation and Genomics, Wiley Blackwell. UK.
5. Sambrook and Russell. 2001. Molecular Cloning. 3rd Edn. CSHL Press. USA.
6. Senger, Gupta and Sharma. 2010. Laboratory manual on Biotechnology. WH Publishers. USA.
7. Singh, B.D. 2008. Biotechnology. Narosa Publishing House. New Delhi

M.Sc. BOTANY			Third Semester
COURSE CODE: MBT-304			COURSE TYPE: OSC
COURSE TITLE: INTELLECTUAL PROPERTY, HUMAN RIGHTS & ENVIRONMENT : BASICS			
CREDIT: 6		HOURSE: 90	
THEORY: 6	PRACTICAL: 00	THEORY: 90	PRACTICAL: 00
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 00	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of Intellectual property, Patenting, Human rights and importance of laws.			
UNIT – 1	Patent :- Introduction and concepts, Historical overview. Subject matter of patent, Kinds of patents. Development of Law of Patents through international treaties and conventions including TRIPS. Agreements. Procedure for grantof patents and term of patent. Surrender, revocation and restoration of patent. Rights and obligationsof Patentee. Grant of compulsory licenses. Infringment of patent and legal remedies. Offences and penalties. Discussionon leading cases.		
UNIT – 2	Meaning of Copyright, Historical Evolution. Subject matter of copyright.Literary works, Dramatic works & Musical works. Computer Programme, Cinematographic films. Registration of Copyrights. Term of Copyright and Ownership of Copyrights. Neighboring Rights. Rights of Performers & Broadcasters. Assignment of Copyright. Author's Special Rights (Moral Rights). Infringment of Copyrights and defenses. Remedies against infringement (Jurisdictionof Courts and penalties). International conventions including TRIPS. Agreement WIPO, UCC, Paris Union, Beme convention, UNESCO. Discussion on leading cases.		
UNIT – 3	Rights: Meaning Human Rights – Meaning and Essentials Kinds of Human Rights Rights related to Life, Liberty, Equals & Disable		
UNIT – 4	National Human Rights Commission. State Human Rights Commission. High Court. Regional Court Procedure & Functions of High & Regional Court.		
UNIT – 5	Right to Environment as Human Right. International Humanitarian Law and Environment Environment and Conflict Management Nature and Origin of International Environmental Organisations (IEOs) Introduction to Sustainable Development and Environment		

	Sustainable Development and Environmental Governance.

Suggested Readings :-

1. **G.B. Reddy, Intellectual Property Rights and Law, Gogia Law Agency, Hyderabad.**
2. **S.R. Myneni, Intellectual Property Law, Eastern Law House, Calcutta.**
3. **P. Narayanan, Intellectual Property Rights and Law (1999), Eastern Law House, Calcutta.**
4. **Vikas vashistha, Law and Practice of Intellectual Property, (1999), Bharat Law House, New Delhi.**
5. **Comish W.R. Intellectual Property, 3rd,ed. (1996), Sweet and Maxwell**
6. **P.S. Sangal and Kishor Singh, Indian Patent System and Paris Convention.**
7. **Comish W.R. Intellectual Property, Patents, Copyrights and Allied Rights, (2005)**
8. **Bibeck Debroy,Intellectual Property Rights, (1998), Rajiv Gandhi Foundation.**

M.Sc. BOTANY			Third Semester
COURSE CODE: MBT-305 : C01			COURSE TYPE: ECC/CB
COURSE TITLE: PLANT ANATOMY AND ECONOMIC BOTANY			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Plants for society.			
UNIT – 1	Shoot apical meristem, Root apical meristem, Control of cell and tissue differentiation especially xylem and phloem, secretory ducts and laticifers, wood development in relation to environmental factors.		
UNIT – 2	Types and phylogeny of stomata, types of nodal anatomy, phylogenetic and evolutionary consideration of nodal anatomy, types of cambium, factors influencing the growth of cambium, experimental control of cambial activity.		
UNIT – 3	Seed anatomy of Monocotyledonous and Dicotyledonous, special features of seeds or seed appendages, seed germination seedling growth, hormonal control of seedling growth.		
UNIT – 4	Origin of Cultivated Plants, Cereals, Millets, Pulses, Oil yielding plants, Spices and condiments, Beverage plants		
UNIT – 5	Plants of medicinal importance, Fumitories and Masticatories, Fibres, Wood, Energy Plantation: Petrocrops and Firewood		

Suggested Readings:

1. Carlquist, S.C. (1961),Comparative Plant Anatomy Holt, Rinehart and Winston, New York Press.
2. Carlquist S. (2001), Comparative Wood Anatomy Systematic, Ecological and Evolutionary Aspects of Dicotyledon Wood.
3. Cutter, Elizabeth (1969), Plant Anatomy part –I Cells and Tissues IInd edition,Edward Arnold,London
4. Cutter, Elizabeth (1971), Plant Anatomy Part- II Organs ,Edward Arnold London
5. Dickison W.C. (2000), Integrative Plant Anatomy. Academic Press
6. Eames, Arthur J. & Mac Daniels Laurence H. (1951), An Introduction To Plant Anatomy, McGraw Hill.
7. Esau, Katherine, (1965), Plant Anatomy, , John Wiley and Sons. Inc, New York.

8. Esau, Katherine, (1960), Anatomy of seed Plants. Wiley, New York.
9. Evert, Ray. F. (1960), Esau's Plant Anatomy. John Wiley & Sons.
10. Fahn, A. (1982), Plant Anatomy Vol I and Vol II Pergamon Press. Oxford New York.
11. Jane F.W (1934)-Aspects of the Study of Wood Anatomy. Science Reviews2000 Ltd.
12. J. Mauseth, James D. (1988) Plant Anatomy. Benjamin/Cummings.

M.Sc. BOTANY			Third Semester
COURSE CODE: MBT-305 : C02			COURSE TYPE: ECC/CB
COURSE TITLE: DEVELOPMENTAL BIOLOGY			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of internal tissue system of plants and development of stem, root, flower and embryo.			
UNIT – 1	Archegoniatae : Comparative morphology and developmental anatomy of Hepaticae, Anthocerotae and Musci. Comparative anatomy of vegetative organs of Pteridophytes. Study of stem apex, leaf initiation and early leaf ontogeny in ferns. Development of long and short shoots. Origin and pattern of development of cortex, pith and procambium in conifers.		
UNIT – 2	Vascular Plants : Meristems; patterns of cell fate, determination and lineage in root and shoot. Leaf growth and differentiation. Secondary growth. Wood development and its diversity. Cambial variants. Ultrastructure and control of xylem and phloem differentiation. Secretory ducts and laticifers. Flower, seed and fruit anatomy. Patterns of evolution in seed. Anatomical adaptationsfor special habitates, biotic and abiotic stresses.		
UNIT – 3	Development of Flower : Transition to flowering-vegetative to reproductive evocation. Floral homeotic mutations in Arabidopsis, Antirrhinum and Petunia. Axis development in flower. Gender expression in monoecious and dioecious plants. Develpmental biology of male and female gametophytes: Regulation of anther and ovule development. Microsporogenesis and microgametogenesis. Megasoprogenesis and megagametogenesis. Male sterility- mechanism and applications. Pollen embryogenesis.		
UNIT – 4	Pollen-Pistil Interaction: In vivo and in vitro pollen germination. Pollen tube growth and guidance. Double fertilization. Self-compatibility mechanisms, incongruity.		
UNIT – 5	Embryogenesis and seed development: Polarity during embryogenesis, Pattern mutants. In vitro fertilization, Endosperm development, Apomixis, Polyembryony, Somatic embryogenesis.		

Suggested Readings:-

1. Bhatnagar S.P. and Moitra A.(2005) Gymnosperms, New Age Interactive(P) Ltd. Publishers, New Delhi.
2. Carlquist S.(2001). Comparative Wood Anatomy, Springer-Verlag, Germany.
3. Culter D.F.(1978). Applied Plant Anatomy, Longman, United Kingdom.
4. Howell S.H.(1998), Molecular Genetics of Plant development, Cambridge University Press.
5. Leyser O. and Day S.(2003), Mechanism of Plant Development, Blackwell Press.
6. Parihar N.S.(1993), An Introduction to Embryophyta: Vol. I- Bryophyta, Vol. II- Pteridophyta, Central Book Dept. Allahabad.
7. Raghavan V. (2000) Developmental Biology of Flowering Plants, Cambridge University Press.
8. Richards A.J.(1986), Plant Breeding System, George Allen and Unwin.
9. Shivanna K.R.(2003), Pollen biology and Biotechnology, Science Publishers.

M.Sc. BOTANY			Third Semester
COURSE CODE: MBT-305 : C03			COURSE TYPE: ECC/CB
COURSE TITLE: BIOSTATISTICS			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Biostatistics in Plant Sciences.			
UNIT – 1	Unit-1 Scope of Biostatistics, variables in biology, collection, classification, tabulation of data. Frequency distribution, Diagrammatic and graphical presentation of statistical data, Sampling techniques. Measures of central location and dispersion,Simple measure of skewness and Kurtosi, Probability, conditional probability.		
UNIT – 2	Unit-2 Binomial, Poisson and Normal Distribution Correlation and Regression, Least Square method of fitting, Standard error of estimate, Correlation and regression coefficient. Basic idea of significance testing, level of significance, students,'t'test, χ^2 (chi-square) test and F-test, Analysis of variance.		
UNIT – 3	Unit-3 Biological databases, EMBL, DDBJ, TAIR, KEGG, Swis-prot, Optimal Pairwise Alignment- Biological Sequences and the Exact String Matching Problem-Fast Alignments: Genome Comparisons and Database Searches		
UNIT – 4	Unit-4 Multiple Sequence Alignment-Sequence Profiles and Hidden Markov Models.- Gene Prediction-Phylogeny-Sequence Variation and Molecular Evolution		
UNIT – 5	Unit-5 Testing Evolutionary Hypotheses, In silico analysis of phylogeny, construction of phylogenetic tree, dendrogram, Computational phylogenetics, Construction of QTL mapping, Microarray data analysis.		

Suggested Readings:

1. Bernard, A. Rosner, 2006. Fundamentals of Biostatics. Thompson Publication. Canada.
2. Khan and Khanam. 2003. Fundamental of Biostatistics. Ukaaz Publications. Hyderabad.
3. Krawetz. 2003. Introduction to Bioinformatics: A theoretical and Practical Approach. Humana Press. USA.
4. Miguel and Rade. 2003. Bioinformatics and Genome. Horizon Scientific Press.Utah. USA.

LBT311: Based on papers MBT301, MBT302 and MBT303
LBT312: Based on papers MBT304 and MBT305

SEMESTER-IV

Course Code	Course Type	Course Title	Marks	Credits
MBT-401	CCC	PLANT BIOCHEMISTRY	100	6
MBT-402	CCC	PLANT PATHOLOGY	100	6
MBT-403	CCC	INSTRUMENTATION, MOLECULAR TECHNIQUES AND BIOINFORMATICS	100	6
MBT-404	SSC/PRJ	DISSERTATION	100	6
MBT-405 (ELECTIVE PAPER)	ECC/CB	D01 - ETHNOBOTANYAND CONSERVATION OF TRADITIONAL KNOWLEDGE	100	6
	ECC/CB	D02 - PLANT RESOURCE UTILIZATION AND CONSERVATION		
	ECC/CB	D03 -PLANT QUARANTINE		
LBT-411	CCC	Based on papers MBT401 and MBT402	50	4
LBT-412	CCC & ECC	Based on papers MBT403 and MBT405	50	4

M.Sc. BOTANY			FOURTH Semester
COURSE CODE: MBT-401 :			COURSE TYPE: CCC
COURSE TITLE: PLANT BIOCHEMISTRY			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Biochemical Compounds of Plants.			

UNIT – 1	Law of mass action, dissociation of water and its ion product (Kw), pH, ionization of weak acids and weak bases, the Henderson-Hasselbalch equation, physiological buffers. Biochemical energetics: General concept, laws of thermodynamics, entropy, enthalpy, free energy, redox potential, energy rich phosphorus compounds
UNIT – 2	Biosynthesis and degradation of carbohydrates in higher plants Structure of protein, Ramchandran plot Biosynthesis of fatty acids, ß oxidation of fatty acids, glyoxylate cycle
UNIT – 3	Enzymology: General aspects, prosthetic groups and coenzymes, mechanism of action, kinetics, Michaelis- Menton equation, factors affecting enzyme catalysis, enzyme inhibition, regulatory enzymes, isoenzymes, ribozymes
UNIT – 4	Biological Nitrogen Fixation: Nitrogenase enzyme, substrate for nitrogenase, reaction mechanism, strategies to exclude oxygen and need to control hydrogen evolution Inorganic nitrogen metabolism: Introduction, nitrate transport, nitrate and nitrite reductases, inhibitors, localization and regulation of nitrate and nitrite reductases, pathways of ammonia assimilation, regulation of nitrogen assimilation
UNIT – 5	Sulphur and phosphorus metabolism: Sulphate uptake, activation and transfer, assimilatory pathways of sulphate reduction, transport and assimilation of phosphate

Suggested readings:

1. Wilson, K. and Walker, J., 2000, Practical Biochemistry: principles & techniques. Cambridge University Press. ISBN 0521799651.

2. Buchanan, B., Gruissem, W., & Jones, R.L., 2002, Biochemistry and Molecular Biology of Plants. American Society of PlantBiologists, USA.

3. Watson, JD, Baker, TA, Bell, SP, Gann, A, Levine, M and Richard, L. 2008. Molecular Biology of the Gene. Pearson Education Inc.

4. Nelson, D .L. and Cox, M.M., 2008, Lehninger Principles of Biochemistry, W. H. Freeman & Co, New York, USA

5. Murray, R, Murray, RK, Bender, D, Gotham, KM, Kennelly, PJ, Rodwell, V and Weil, PA. 2012. Harper's Illustrated Biochemistry McGraw Hill

6. Wilhelm Gruissem, Russell L.Jones, 2000, Biochemistry and molecular biology of plants. American Society of Plant Physiologists,

7. .Berg, J.M., Tymoczko, J.L. & Stryer, L. 2011, Biochemistry, Freeman & Co., New York, USA.

8. Weil, J.H., 1990, General Biochemistry, Wiley Eastern Limited, New Age International Limited. New Delhi.

9. Lea P.J. and Leegood R.C., 1999, Plant Biochemistry & Molecular Biology, John Wiley & Sons, NewYork

M.Sc. BOTANY			Fourth Semester
COURSE CODE: MBT-402			COURSE TYPE: CCC
COURSE TITLE: **PLANT PATHOLOGY**			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of Plant diseases and their control.			
UNIT – 1	History of plant pathology, identification of symptoms and signs, observation of symptoms, isolation, growth and identification of causal agents, losses caused by plant diseases, basic procedure in diagnosis of plant diseases.		
UNIT – 2	Parasitism and pathogenecity, development of plant diseases, inoculations, penetration, infection, dissemination of pathogen, oxidative burst, PR proteins, SAR, phytoalexins, factors affecting distribution of disease.		
UNIT – 3	Pathogenesis, Chemical weapons of pathogens, microbial toxins, growth regulators and detoxification of antimicrobial molecules in disease development Pre-existing defense structures, pre-existing chemical defense, induced structural and biochemical defense.		
UNIT – 4	Nature and properties of pathogenic bacteria, viruses, mycoplasma and nematodes, symptoms, transmission, characterization. Study of plant disease caused by Bacteria, Viruses, Mycoplasma and Nematodes and their control		

	measures.
UNIT – 5	Study of fungal diseases, symptoms caused by fungi on plants, mechanisms of infection, penetration, colonization and their control measures. General account of some important fungal diseases of economically important crops of central India and their control measures.

Suggested Readings:

1. Aggrawal Ashok and Mehrotra R S. 2002. Plant Pathology. Tata Mcgraw Hill, 2nd edition. Mumbai.
2. Agrios George N. 2005. Plant Pathology, Academic Press, 5th Edition. UK.
3. Robert B. 2008. Plant Pathology: Techniques and Protocols (Methods in Molecular Biology), Humana Press. USA.
4. Gail L. Schumann and Cleora J. D'Arcy 2009. Essential Plant Pathology, 2nd Edition. American Phytopathological Society. USA.
5. Sharma P. 2006. Plant Pathology, Alpha Science International Ltd. New Delhi.
6. Trigiano Robert N. 2007. Plant Pathology Concepts and Laboratory Exercises. 2nd Edition, CRC Press. U.K

M.Sc. BOTANY			Fourth Semester
COURSE CODE: MBT-403			COURSE TYPE: CCC
COURSE TITLE: INSTRUMENTATION, MOLECULAR TECHNIQUES AND BIOINFORMATICS			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Modern techniques in Plant Science.			
UNIT – 1	**Microscopy:** Bright-field microscope, Dark-field, Phase-contrast, Differential interference contrast, Fluorescence, Transmission and scanning electron microscopy, confocal microscopy; Staining of different cells, cell organelles and tissues.		
UNIT – 2	**Chromatography:** Thin layer, ion exchange, gel filtration, affinity chromatography, GLC, HPLC. Spectroscopy: Beer-Lambert's law, molar extinction coefficient and calculation, Absorption spectrum, Colorimeter and UV-Vis Spectrophotometer, Nuclear Magnetic Resonance (NMR). ESI MS, MALDI-TOF Application of tracer techniques in biology, radioactive isotopes, autoradiography		
UNIT – 3	**Electrophoresis:** Polyacrylamide Gel Electrophoresis (PAGE), Agarose Gel Electrophoresis (AGE), native-Page, SDS-PAGE, Isoelectric focusing (IEF), 2D-		

	electrophoresis Isolation and purification of genomic and plasmid DNA, RNA and proteins Blotting Technique: Southern, Northern and Western blotting
UNIT – 4	**DNA Amplification:** PCR, RT-PCR, genome mapping and expression analysis, RFLP, RAPD, AFLP, *In situ* hybridization, FISH, EST, Microarray
UNIT – 5	Bioinformatics: Bioinformatics in genome sequencing and annotation; Databases - NCBI, EMBL, DDBJ, Genbank, Pubmed, Patent databases, TAIR, PDB, ATIDB. Online tools - BLAST, ORF finder, Primer3, protein motif and structure prediction tools.

Suggested Readings:

1. Becker, JM, Caldwell, GA & Zachgo, EA (1996). Biotechnology: A Laboratory Course, Academic Press, Inc, San Diego,California
2. Wilson, K, Walker, J (1997). Principles and Techniques of Biochemistry and Molecular Biology,
Cambridge University Press, Cambridge
3. Sambrook, J, Fritsch EF, Maiatis,T (2000). Molecular Cloning: A Laboratory Manual Cold Spring
Harbor Laboratory Press, New York
4. Primrose, SB (1994). Molecular Biotechnology, Blackwell Scientific Pub, Oxford.
5. Reece, RJ (2004). Analysis of Genes and Genomes, Wiley
6. Arthur, M. 2002. Introduction to Bioinformatics. Oxford University Press. New
Delhi.
7. Krawetz. 2003. Introduction to Bioinformatics: A theoretical and Practical Approach. Humana Press. USA.
8. Miguel and Rade. 2003. Bioinformatics and Genome. Horizon Scientific Press.Utah. USA.

MBT-404	SSC/PRJ	DISSERTATION	100	6

M.Sc. BOTANY			Fourth Semester
COURSE CODE: MBT-405 : D01			COURSE TYPE: ECC/CB
COURSE TITLE: ETHNOBOTANY AND CONSERVATION OF TRADITIONAL KNOWLEDGE			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Local Plants and Traditional Knowladge.			
UNIT – 1	Ethnobotany: Knowledge of culture and belief, Introduction and relevance in the modern context, documentation of Ethnobotanical wisdom		
UNIT – 2	The centres of Ethnobotanical studies in the world, Ethnobotanical Hot Spots, Scope of Ethnobotanical research in Chhattisgarh, Plants in magico-religious beliefs, social customs and beliefs		
UNIT – 3	Tribal societies of Chhattisgarh: origin, customs and beliefs		
UNIT – 4	Plants in Traditional medical practices, Ethnoveterinary medicines, Important ethnobotanical drugs of India, WHO and Ethno-directed drug discovery		
UNIT – 5	Conservation of Traditional Knowledge, IPR, Convention on Biodiversity, Conservation of Biodiversity, Conservation strategies, IUCN Red list categories		

Suggested Readings:

1.Brain K.R, and Turner T.D. 1976. The Practical evaluation of Phytopharmaceuticals. Bristol Wright-Scientehnica. Italy.

2.Chopra, R.N., Nayar S.L. and Chopara I.C. 1956. Glossary of Indian Medicinal plants. CSIR. New Delhi.

3.Das, A.P. and Pandey, A.K. 2007. Advances in Ethnobotany. Bishen Singh and Mahendra Pal Singh, Dehradun.

4. Jain and Mudgal. 1996. Dictionary of Ethnobotany. Deep Publication, Delhi.

5. Jain, S.K. 1990. Contributions of Indian Ethnobotany. Scientific publishers, Jodhpur.
6. Jain, S.K. 1995. Manual of Ethnobotany, Scientific Publishers, Jodhpur.
7.Kokate C. K., Purohit A. P. and Gokhale S. B. 2003. Pharmacognosy 22nd Edition, Nirali Prakashan. Pune.
8.Mukherjee P.K. 2002. Quality control of Herbal Drugs – An approach to Evaluation of Botanicals, Business Horizons, New Delhi, 1st Edition.
9.Trease G. E. and Evans, W. C. 2006. Pharmacognosy. 10th Edition, Williams and Wilkins, Baltimore. USA.

M.Sc. BOTANY			Fourth Semester
COURSE CODE: MBT-405 : D02			COURSE TYPE: ECC/CB
COURSE TITLE: **Plant Resource Utilization and Conservation**			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Microbes.			
UNIT – 1	General aspects on resource types: Renewable resources, non-renewable resources, Resource degradation, Resource conservation; Natural resources, biological resources, plants as natural resources		
UNIT – 2	Utilization of plant resources, Bio-control- soruces and advantages, Bio-control as agribusiness, Untapped potential plant resources, seaweeds as potential resources– food, fodder and biofertilizer; Plant resources used in cosmetics, aromatics and pharmaceuticals, fibres; forest as potential resources: vegetable oil yielding plants, bioenergy		
UNIT – 3	Biodiversity, Levels and types of biodiversity, uses of biodiversity, Distribution of biodiversity, Regional pattern of biodiversity, Hot spots of biodiversity, Threats to biodiversity – Habitat loss and fragmentation, Alien invasive species, disturbance and pollution, harvesting and overexploitaion.		
UNIT – 4	An overview of Indian biodiversity; Biogeographic regions (zone) of India; Hot spots of Indian biodiversity; Status of biodiversity conservation in India; Protected area network of India; The Biological Diversity Act 2002; Bio-prospecting – Biochemical resources from plants.		

UNIT – 5	Conservation of Biodiversity; IUCN red list categories, In situ conservation strategies – Protected areas, Biosphere reserves; Ex-situ conservation strategies – Restoration of endangered species, Sustainable use and public participation; International efforts for conserving biodiversity

Suggested Readings:

1. Chandel K. P. S. Shukla G. and Sharma Neelam.1996. .Biodiversity in Medicinal and Aromatic Plants in India – Conservation and Utilization, Indian Bureau of Plant Genetic Resources, New Delhi,
2. Kaufman Peter B. et al. 1999. Natural Products from Plants, CRC Press. UK.
3. Primack R.B. 2000. A Primer of Conservation Biology, Sinauer Asso. Publ., Massachusetts. USA.
4. Sahoo S. 2002. Plant Resource Utilization. Allied Publishers. Nagpur.
5. Singh J.S. Singh S.P. and Gupta S.R., 2006, Ecology, Environment and Resource Conservation, S. Chand Publication, New Delhi,
6. Trivedi P.C. and Sharma N. 2010. Plant Resource Utilization and Conservation, Pointer Publishers. Jaipur.

M.Sc. BOTANY			Fourth Semester
COURSE CODE: MBT-405 : D03			COURSE TYPE: ECC/CB
COURSE TITLE: **PLANT QUARANTINE**			
CREDIT: 8		HOURSE: 135	
THEORY: 6	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS			
THEORY: 100 (30+70)		PRACTICAL: 25	
OBJECTIVES: This course is aimed towords generating fundamental knowledge, concepts and dimensions of importance and applications of Rules of Plant Quarentine.			
UNIT – 1	Definition of pest, pesticides and transgenics as per Govt. notification; relative importance; Quarantine – domestic and International Quarantine restrictions in the movement of agricultural produce, seeds and planting materials.		
UNIT – 2	Case histories of exotic pests/diseases and their status. Plant protection organization in India. Acts related to registration of pesticides and transgenics.		
UNIT – 3	History of quarantine legislation, PQ Order 2003. Environmental acts, Industrial registration; APEDA, Import and Export of bio-control agents.		
UNIT – 4	Identification of pest/disease free areas; contamination of food with toxigens, microorganisms and their elimination; Symptomatic diagnosis and their techniques to detect pest/pathogen infestation; VHT and other safer techniques of disinfestation/ salvaging of infected material.		
UNIT – 5	WTO regulations; non-tariff barriers; Pest risk analysis, good laboratory practices for pesticide laboratories; Pesticide industry; Sanitary and Phytosanitary measures.		

Suggested Readings:

1 Rajeev K & Mukherjee RC.1996.Role of Plant Quarantine in IPM. Aditya Books.

2 Rhower GG. 1991. Regulatory Plant Pest Management. In; Hand book of Pest Management in Agriculture. 2nd Ed. Vol. II (Ed. David Pimental). CRC Press.

LBT411: Based on papers MBT401 and MBT402
LBT412: Based on papers MBT403 and MBT405

DEPARTMENT OF GEOGRAPHY

- M. A. in GEOGRAPHY : FACULTY OF SOCIAL SCIENCE
- FIRST SEMESTER (ODD SEMESTER)

Eligibility Criteria (Qualifying Exams)	Admission Criteria	Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			EoSE Duration (Hrs)	
						L	T	P	Thy	P
Bachelor Degree in the concerned subject/discipline	Merit List / Entrance Test (whichever is decided by the University) / Reservation of seats under Policy	GEO 101	CCC	GEOMORPHOLOGY	5	4	2	00	3	0
		GEO 111	CCC	ADVANCED CARTOGRAPHY - I	2	00	00	3	0	3
		GEO102	CCC	CLIMATOLOGY	6	4	3	00	3	0
		GEO103	CCC	GEOGRAPHY OF INDIA	6	4	3	00	3	0
		GEO501	DSC	RESEARCH METHODOLOGY & COMPUTER APPLICATIONS BASICS	6	4	3	00	3	00
		GEO401	ECC	CONSTITUTIONALISM & INDIAN POLITICAL SYSTEM	6	4	3	00	3	00
		GEO 402	ECC	TROPICAL GEOMORPHOLOGY						
		GEO403	ECC	FLUVIAL GEOMORPHOLOGY						
		GEO404	ECC	GEOGRAPHICAL DIMENSIONS OF HYDROLOGY						
		MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 31			TOTAL= 31					

M.A. in GEOGRAPHY
(FIRST SEMESTER)

COURSE CODE:	GEO 101	COURSE TYPE :	CCC
COURSE TITLE:	GEOMORPHOLOGY		
CREDIT: 07		HOURS: 105	
THEORY: 05	PRACTICAL: 01	THEORY: 75	PRACTICAL: 30
MARKS: 100			
THEORY: 80	CIA : 20	PRACTICAL: 100	

OBJECTIVE: The objectives of the course is to familiarize the students with the need for understanding of geomorphology with reference to certain fundamental concepts focusing on the unity of geomorphology in the earth materials and the processes with its articulation in terms of time. Process component of geomorphology is segmented into the internal and external processes of landscape evolution. Finally a few selected applications of geomorphology to societal requirements and quality of environment is dealt with

UNIT-1 (20 Hrs)

Basics of Geomorphology
1.1 Nature, scope and contents of Geomorphology
1.2 Development of geomorphic thought
1.3 Catastrophism, Uniformitarianism, Neocatastrophism

UNIT-2 (20 Hrs)

Continents and Ocean Basins (Tectonic Dislocations)
2.1 Evolution of continents and ocean basins
2.2 Continental Drift Theory - Plate Tectonics
2.3 Earthquakes and Volcanoes: – causes and consequences, associated features

UNIT-3 (20 Hrs)

Endogenetic Forces
3.1 Constitution of the earth's interior
3.2 Geosynclines: Geosynclinal Theory of Kosbor
3.3 Holme's Convection Current Theory
3.4 Tectonics of volcanoes

UNIT-4 (15 Hrs)

Cycle of Erosion
4.1 Davisian Model of Cycle of Erosion
4.2 Penck's Morphological System
4.3 Geomorphic Landforms-Fluvial, Karst, Arid, Glacial
4.4 Applied Geomorphology

SUGGESTED READING

1. Singh Savindra - "Geomorphology" (Hindi) Prayag Pustak Bhavan Allahabad
2. Bloom A.L. - Geomorphology A Systematic Analysis.
3. Spark, B.W. - Geomorphology
4. Strahler A.H. - Elements of Physical Geography.

M.A. Geography
Semester First

LABORATORY WORK
GEO 11 1

PRACTICAL -1-ADVANCED CARTOGRAPHY

Graphs and Diagrams : Triangular graph. Logarithmic and semi logarithmic graphs, scatter graphs; climatograph. Proportional circles, spheres and cubes.

Thematic Maps : Choropleth maps, Isolines, Flow maps, Isochrones and class intervals.

Morphometric Analysis : Profiles, Slope Analysis; Altimetric, and Clinographic curves; Block Diagrams.

SUGGESTED READINGS

1. Monk house F.J. & H.R. Wilkinson : Maps and Diagrams, Methuen, London.
2. Sharma J.P.-Practical Geography, Rastogi Publication, Meerut
3. Chauhan P.R.-Practical Geography, VashundharaPrakashan, Gorakhpur

Catastrophism — केटास्ट्रोफिज्म
Uniformitarianism — यूनिफार्मिटेरियनिज्म
Neocatastrophism — नियोकेटास्ट्रोफिज्म

M.A. in GEOGRAPHY
(FIRST SEMESTER)

COURSE CODE: GEO 102 COURSE TYPE : CCC

COURSE TITLE: CLIMATOLOGY

CREDIT: 05
THEORY: 05
HOURS: 60
THEORY: 60

MARKS: 100
THEORY: 80 CCA : 20

OBJECTIVE : The aim of the course is to provide an understanding of weather phenomena; dynamics of global climates and generation of climatic information and their application

UNIT-I 20 Hrs.

Climate System पृथ्वी के वायुमंडल की संरचना
1.1 Earth-atmospheric system; components, characteristics and interactions – विशेषताएँ
1.2 Current trends in climatology
1.3 Recent concerns – climate change and its impact

UNIT-II 20 Hrs.

Applied Climatology
2.1 Micro-climatology – influencing factors – rural and urban climates
2.2 Agro-climatology – soil-plant-climate relationship, weather and crop production, agro-climatic regions of India
2.3 Bio-climatology: climate and human health, comfort zones

UNIT-III 20 Hrs.

Air Masses and Fronts
3.1 Air masses: origin, classification, types वायु राशियाँ – वर्गीकरण, प्रकार
3.2 Fronts: Frontogenesis and Frontolysis – classification of fronts वाताग्र
3.3 Extra-tropical cyclones: formation, impact
3.4 Weather forecasting: traditional and modern techniques

UNIT-IV 20 Hrs.

Classification of Climate
4.1 Basis of climatic classification
4.2 Koppen's system of climatic classification – salient features, distribution of types
4.3 Thornthwaite's sectional climatic classification – application
4.4 Comparative analysis of Koppen and Thornthwaite classifications
4.5 The Monsoon: Origin of monsoon: classical and recent views
Prediction of monsoon: problems and prospects

M.A. in GEOGRAPHY
(FIRST SEMESTER)

COURSE CODE: GEO 103	COURSE TYPE : CC
COURSE TITLE: GEOGRAPHY OF INDIA	
CREDIT: 04	HOURS: 56
THEORY: 04	THEORY: 60
MARKS: 100	
THEORY: 80 CCA : 20	

OBJECTIVE - The course is aimed at presenting a comprehensive, integrated and empirically based profile of India. Besides, the objective is to highlight the linkages between systematic geography of India with the regional personality of the country. The course is designed so as to present the role of the geographical positioning of India in moulding its geopolitical concerns by and its inter-relations with other countries.

UNIT-I (20 Hrs.)

Physical and Biological elements in the Geography of India : Geological structure, relief, climate, Drainage, vegetation and soils.

UNIT-II (20 Hrs.)

Agriculture : Major characteristics and problems, Impact of infrastructural and institutional factors on agriculture. Important crops-wheat, rice, cotton, sugarcane, oil-seeds, tea and coffee; Agricultural regions. Green revolution, Agro-climatic regions.

UNIT-III (20 Hrs.)

Sources of power : Coal; Petroleum, Natural gas. Hydroelectricity and Atomic energy. Mineral resources with special reference to iron ore, manganese and bauxite. Industrial development with special reference to iron and steel, cement, cotton, jute, sugar and paper industries; Industrial regions. Transport Network, Trade-National and International, Trade Policy of India.

UNIT-IV (20 Hrs.)

Regional division of India : Purpose and Methodology. Major schemes of regions of India: D.H.K. Spate and R.L. Singh.
Physical and cultural, geography of Chhattisgarh State.

COURSE CODE: GEO_501 COURSE TYPE :DSC

COURSE TITLE :RESEARCH METHODOLOGY & COMPUTER APPLICATION: BASICS

CREDIT: 06 THEORY: 06	HOURS : 90 THEORY: 90

MARKS : 100
THEORY: 80 CCA : 20

OBJECTIVE:

- Understands the concept and place of research in concerned subject
- Gets acquainted with various resources for research
- Becomes familiar with various tools of research
- Gets conversant with sampling techniques, methods of research and techniques of analysis of data
- Achieves skills in various research writings
- Gets acquainted with computer Fundementals and Office Software Package .

UNIT - 1 15 Hrs	**CONCEPT OF RESEARCH :** Meaning and characteristics of research , Steps in research process , Types of research - i) Basic, applied and action research ii) Quantitative and qualitative research, Areas of research in concern discipline **SELECTION OF PROBLEM FOR RESEARCH :** Sources of the selection of the problem , Criteria of the selection of the problem ,Drafting a research proposal , Meaning and types of variables ,Meaning and types of hypotheses,
UNIT - 2 15 Hrs	**TOOLS OF RESEARCH :** Meaning and general information about construction procedure of (i) Questionnaire, (ii) Interview, (iii) Psychological test, (iv) observation (v) Rating scale (vi) Attitude scale and (vii) check list , Advantages and disadvantages of above tools **SAMPLING :** Meaning of population and sample , Importance and characteristics of sample , Sampling techniques - i) Probability sampling : random sampling, stratified random sampling, systematic sampling, cluster sampling ii) Non-probability sampling: incidental sampling, purposive sampling, quota sampling

UNIT - V 15 Hrs

METHODS OF RESEARCH

Meaning and conducting procedure of following methods of research :- Historical method, Survey method , Case study , Causal comparative method ; Developmental methods, Experimental methods

UNIT - VI 15 Hrs

TREATMENT OF DATA :

Level of measurements of data ; Steps in treatment of data: editing, coding, classification, tabulation, analysis and interpretation of results

WRITING RESEARCH REPORT :

Sections of report : Preliminary section , Content section : various chapters , Supplementary section : appendices, references, abstract ; Format and style

UNIT - I 15 Hrs

Computer Fundamentals

Computer System : Features, Basic Applications of Computer, Generations of computers.

Parts of Computer System : Block Diagram of Computer System ; Central Processing Unit (CPU) ; Concepts and types of Hardware and Software, Input Devices - Mouse, Keyboard, Scanner, Bar Code Reader, Track ball ; Output Devices - Monitor, Printer, Plotter, Speaker ; Computer Memory : primary and secondary memory, magnetic and optical storage devices,

Operating Systems - MS Windows : Basics of Windows OS ; Components of Windows - icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders ; Control panel : display properties, adding and removing software and hardware, setting date and time, screensaver and appearance ; Windows Accessories : Calculator, Notepad, WordPad, Paint Brush, Command Prompt, Windows Explorer

UNIT - II 15 Hrs

Office Software Package

Word Processing - MS Word : Creating, Saving, Opening, Editing, Formatting, Page Setup and printing Documents ; Using tables, pictures, and charts in Documents ; Using Mail Merge : sending a document to a group of people and creating form, letters and label.

Spreadsheet - MS Excel : Opening a Blank or New Workbook, entering data/Function/ Formula into worksheet cell, Saving, Editing, Formatting, Page Setup and printing Workbooks.

Presentation Software - MS Power Point : Creating and enhancing a presentation, modifying a presentation, working with visual elements, adding Animations & Transitions and delivering a presentation.

M.A. in GEOGRAPHY
(FIRST SEMESTER)

COURSE TYPE : EC/CB

COURSE CODE : GEO 102

COURSE TITLE : TROPICAL GEOMORPHOLOGY

CREDIT : 5

HOURS : 90

THEORY : 90

MARKS : 100

EXAM : 80 CIA : 20

OBJECTIVE : As the arid and semi—arid climatic regions occupy a major portion of the continents, it becomes essential to understand the deserts in detail as they hold a key to agricultural resource evaluation.

Aeolian environments are particularly sensitive to aridity, bio-mass and human interference. All these activities affect wind shear in different degrees and time in aeolian processes of erosion and deposition. These processes and their resulting forms are highlighted in the course content.

UNIT - I (18 Hrs)

Basics of Tropical Geomorphology :
1.1 Definition, scope and significance
1.2 Geomorphic processes in tropics
1.3 Factors - Climate, vegetation and others
1.4 Concept of morphogenetic regions

UNIT - II (18 Hrs)

Structural landforms of tropics :
2.1 Types and processes
2.2 Formation of dome and pediplain
2.3 Deccan Trap landforms – evolution and processes

UNIT - III (18 Hrs)

Fluvial processes in the tropics :
3.1 Characteristics and rates
3.2 Valley forms in humid and arid areas of the tropics
3.3 Tropical deltas and estuaries
3.4 Fluvial landform characteristics of India.

UNIT - IV (18 Hrs)

Coastal processes in the tropics :
4.1 Erosional landforms
4.2 Depositional landforms
4.3 Coastal landform characteristics of India

M.A. in GEOGRAPHY
(FIRST SEMESTER)

COURSE CODE: GEO 403 COURSE TYPE : ECC/CB

COURSE TITLE: FLUVIAL GEOMORPHOLOGY

CREDIT: 04
THEORY: 04

HOURS : 60
THEORY: 60

MARKS : 100
THEORY: 80 CCA : 20

OBJECTIVE : The rivers being the major geomorphic agent of erosion, the course assumes significance as it mainly deals with an understanding of the fluvial forms and processes. The evolution of drainage pattern and alluvial channels are governed by the forces resisting and driving the flow of water. The students are introduced to the activities of these two forces and their resultant effects on the flow patterns, sediment load and channel patterns.

- The use of rivers and the landscape develop certain feedback mechanism within the system which have the ability to alter the human vis-à-vis fluvial environments.

UNIT-1 (15 Hrs.)

Drainage pattern :
1.1 Evolution of drainage pattern
1.2 Factors affecting evolution of drainage pattern
1.3 Drainage network composition and associated laws
1.4 Network composition and flow characteristics

UNIT-2 (15 Hrs.)

Drainage basin characteristics :
2.1 Forms, size, density, bed and bank
2.2 Channel morphology
2.3 Concept of graded profile
2.4 Impact of local base-levels on profile – rejuvenation

UNIT-3 (15 Hrs.)

Fluvial erosion :
3.1 Processes influencing erosive work of river
3.2 Landforms associated with fluvial erosion -Gorges, canyons, laterally eroded valleys and erosional terraces
3.3 Changes in profile with distance from source
3.4 Impact on man and his activities

Unit- 4
20Hrs

Fluvial deposition :

4.1 Processes inducing deposition

4.2 Associated landforms: Piedmont plain, alluvial plain

4.3 Deltas and estuaries

4.4 Depositional landscapes and man

- M.A. in GEOGRAPHY — FACULTY OF SOCIAL SCIENCE
- SECOND SEMESTER (EVEN SEMESTER)

Eligibility Criteria [illegible]	Admission Criteria	Course Code	Course Type	Course (Paper/Subject)	Credits	Contact Hours Per Week			Exam Duration (Hrs.)	
						L	T	P	Th	P
[illegible]	[illegible]	GEO 201	CCC	[illegible] GEOGRAPHY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		GEO 2[illegible]	CCC	MAP PROJECTION AND INTERPRETATION [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		GEO 203	CCC	GEOGRAPHICAL THOUGHT AND METHODOLOGY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		GEO 204	CCC	[illegible]GRAPHY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		GEO P201	PROJECT	SOCIAL OUTREACH AND SKILL DEVELOPMENT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		GEO [illegible]	ECC[illegible]	ENVIRONMENTAL AND FOREST LAWS						
		GEO [illegible]	ECC[illegible]	[illegible] GEOGRAPHY		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		GEO [illegible]	[illegible]	GEOGRAPHY OF SOIL						
		GEO [illegible]	[illegible]	[illegible] GEOMORPHOLOGY						
		[illegible]		[illegible]	TOTAL [illegible]					

M.A. in GEOGRAPHY
(SECOND SEMESTER)

COURSE CODE: GEO 201 COURSE TYPE : CCC

COURSE TITLE : ENVIRONMENTAL GEOGRAPHY

CREDIT: 07

THEORY: 05 PRACTICAL: 02

HOURS: 120

THEORY: 75 PRACTICAL: 45

MARKS: 200

THEORY: 80 ICA : 20 PRACTICAL: 100

OBJECTIVE : The objective of this paper is to provide an overview Environment as geography and its interface with Earth. The course aims to provide an understanding of the existing reality of resource utilization and environmental depletion; further aims to sensitize the students to the concept of sustainable resource use and sustainable development.

UNIT-I (20 Hrs)

Environment : Meaning, definition, concepts and theories related to environment. Environment and its components : Classification, Characteristics and their interdependent relationship. Development of the environmental studies and their approaches; Development of environmentalism in Geography.

UNIT-II (15 Hrs)

Environment and development. Ecological concepts. Geography as human ecology. Ecosystem: meaning definition, Concept and components. Main terrestrial ecosystems of the world-forests and agriculture.

UNIT-III (20 Hrs)

Environmental hazards- natural and human made, environmental pollution - meaning definition, nature and types-air, water, noise and others. Ecological impacts of pollution. Resource use and ecological imbalance with special reference to soil, forests and water resources.

UNIT-IV (20 Hrs)

Environmental Management : meaning, importance and approaches, need for environmental policy and laws. Preservation and conservation of environment through resource management (Green revolution, Chipko movement, National Parks). Environmental Actions: concept, need and importance. Stockholm Conference, Earth Summit, EIA: Definition, methods and need for EM. Environmental education and People's participation.

SUGGESTED READINGS

1. Agrawal, Anil and Sunita Narain. Dying Wisdom: The Fourth Citizen Report. Centre for Science and Environment, New Delhi, 1998.
2. Burton I., R.W. Kates & G.F. White. The Environment as Hazards. O.U.P. New York, 1978, Cartledge, Bryan. Population and the Environment, O.U.P., New York, 1995.
3. Chandna, R.C. Environmental Awareness Kalyan Publishers, New Delhi, 1998.
4. Dawson, J. and J.C. Doornkamp, eds.: Evaluating the Human Environment. Edward Arnold, London, 1975
5. Detwyler, J.R.: Man's impact on Environment, Pelican, 1970
6. Edington, J.M. & M.A. Edington: Ecology and Environmental Planning, Chapman & Hall, London, 1977
7. Goudie, Andrew. The Human Impact on the Natural Environment, Blackwell Oxford, U.K. 1994.
8. Jain, R.K., L.V. Urban and G.S. Stacy, Environmental Impact Analysis-A New Dimension in Decision Making, Van Nostrand Reinhold Co. New York 1977.
9. Khoshoo, T.N. Environmental Concepts and Strategies. Ashish Publishing House, New Delhi.
10. Mohan, M. Ecology and Development. Rawat Publications, Jaipur, 2000.
11. Munn, R.E. Environmental Impact Assessment: Principles and Procedures. John Wiley & Sons, New York, 1979.
12. Narain, Sunita. The Citizen Fifth Report. Centre for Science and Environment, New Delhi 2003.
13. Shrivastava V.K. (1996) PARYAVARAN AVAM PARISTHITIKI, Vasundhara Prakashan, Gorakhpur.
14. Prayag Gayam and other (2008) Pryavaran Bhoogol, Sharda Pustak Bhawan, Allahabad.

LABORATORY WORK / GEOGRAPHY

MAP PROJECTION MAP INTERPRETATION AND SURVEYING (Practical)

Map Projections : Graphical and mathematical construction of world projections.

Interpretation of Maps : Geological Maps.

Principles and methods of topographical surveying involving the use of Theodolite and Dumpy level.
Solution of problems in Surveying.

SUGGESTED READINGS

SUGGESTED READINGS :

1. Davis, R. C. & F. S. Forte :Surveying : Theory and Practical.
2. Kanetkar, T.R. & S.V. Kulkarni :Surveying and levelling part I & II,A.V.G. Prakashan, Poona.
3. Monkhouse F.J. & H.R. Wilkinson : Maps and Diagrams, Methuen, London
4. Sharma J. P- Practical Geography (Hindi) Rastogi Publication ,Meerut
5. Chauhan,P.R. (2006),Practical Geography (Hindi) Vasundhara Publication Gorakhpur
6. Haroon Mohammed(2011)Practical Geography(Hindi) Mishra Trading Co. Varanasi

Geographical Thought

UNIT 1 - औपनिवेशिक समय के ऐतिहासिक परिप्रेक्ष्य में भौगोलिक चिन्तन का विकास में प्रमुख [illegible] के साथ, [illegible] भूगोल का क्षेत्र विज्ञान के वर्गीकरण में भूगोल का स्थान, एक [illegible] विज्ञान के रूप में भूगोल और प्राकृतिक विज्ञान। भूगोल की परिभाषा कार्य क्षेत्र और कार्य, [illegible] भूगोल और

UNIT 2 - [illegible] मानव प्रकृति [illegible] और भूगोल में [illegible] [illegible] [illegible] शताब्दी [illegible] ग्रीक और रोमन विचारकों के योगदान के [illegible] [illegible] समय से भौगोलिक ज्ञान की [illegible] [illegible] और [illegible] भौगोलिक जानकारी भूगोल में [illegible] The [illegible] Age of Maritime [illegible] आदि [illegible]। आधुनिक भूगोल, जर्मन भूगोल [illegible] और [illegible] स्कूलों के विभिन्न ब्रिटिश भूगोल, अमेरिकन स्कूल

विद्यालयों का योगदान

UNIT 3 - वैज्ञानिक स्पष्टीकरण के मार्ग (स्थानिक, [illegible]) [illegible] कारण और प्रभाव, स्पष्टीकरण का प्रकार, [illegible] [illegible], [illegible]/ [illegible], भौतिक [illegible] और भूगोल [illegible] [illegible] के और सिस्टम, [illegible] क्रांति और [illegible]

UNIT 4 - [illegible], व्यवहारवाद और मानववादी, [illegible] भूगोल [illegible] [illegible], आन्दोलन और [illegible] भूगोल [illegible], बदलते प्रतिमान भारतीय भूगोल की [illegible] प्रतिक्रियाएँ

M.A. in GEOGRAPHY
(SECOND SEMESTER)

COURSE CODE:	GEO 202	COURSE TYPE:	CCC
COURSE TITLE:	GEOGRAPHICAL THOUGHT AND METHODOLOGY		
CREDIT 04 THEORY 04		HOURS 60 THEORY 60	
MARKS 100 THEORY 80	CIA - 20		

OBJECTIVE :-To introduce the students to the philosophical and methodological foundations of the subject and its place in the world of knowledge.
- to familiarize them with the major landmarks in development of geographic thought at different periods of time

Unit-I (15 Hrs)

The Field of geography, its place in the classification of science, geography as a social science, and natural science. Definition, scope and functions of geography; Geography as science of relationship, as science of areal differentiation, as spatial science, Spatial Organisation. Geography and environmentalism: forms of man-nature relationship and current view; Dualism in geography; Regional Concept.

Unit-II (15 Hrs)

The growth of geographical knowledge from earliest times up to the 15th century. Contributions of Greek and Roman thinkers. Arab Geographers and their contributions. Geographical information in Ancient Indian literature. The dark age in Geography. The Great Age of Maritime Discovery and Exploration. Contributions of various schools of thought in modern Geography:
(i) German School (ii) French School
(iii) British School (iv) American and Russian Schools.

Unit-III (15 Hrs)

Scientific explanations: routes to scientific explanation (inductive/deductive); Type of explanation: cognitive description, cause and effect, temporal, functional/ecological, systems; Laws, theories and models in geography; Quantitative revolution and philosophy of positivism.

Unit-IV (15 Hrs)

Responses to positivism, behaviourism and humanistic, relevance movement and radical geography. Changing paradigms; Status of Indian Geography, Future of Geography.

1. Abler,Ronald,Adams,John S. Gold Peter : Spatial Organization : The Geographer's view of the world. Prentice Hall, N.J. 1971.
2. Ali S.M. : The Geography of Puranas. Peoples Publishing House, Delhi, 1968.
3. Amedeo, Douglas: An Introduction to Scientific Reasoning in Geography, John Wiley, U.S.A. 1971.
4. Dikshit, R.D. (ed.) : The Art & Science of Geography. Rand Mc Nally & Co., 1982.
5. Hartshorne, R. : Perspectives on Nature of Geography. Rand McNally & Co. 1959.
6. Husain, M. : Evolution of Geographic Thought, Rawat Pub., Jaipur, 1984.
7. Johnston, R.J. : Philosophy and Human Geography, Edward Arnold, London, 1983.
8. Johnston, R. : The Future of Geography, Methuen, London, 1985.
9. Marshall, R. : The Changing Nature of Geography, Hutchinson University Library, London, 1977.
10. Ali, S.M. : Arab Geography.
11. Taylor, G. : Geography in the 20th Century.
12. Kaushik, S.D. (2013) Geographical Thought and Methodology (Hindi) Rastogi Publication Meerut.
13. Panda B.P. and L.N. Verma (2014) Geographical Thought (Hindi) M.P. Hindi Granth Academy Bhopal.
14. Haroon Khan (2018) An Outline of Geographical Thought, (Hindi) Mishra Trading Varanasi.
16. Mazid Hussain "Bhaugolik Chintan Ka Itihas" Rawat Publication.

M.A. in GEOGRAPHY
(SECOND SEMESTER)

COURSE CODE: GEO 201 COURSE TYPE : CCC

COURSE TITLE: OCEANOGRAPHY

CREDIT : 04 HOURS: 60
THEORY: 60

MARKS: 100
THEORY: 80 CCA : 20

OBJECTIVE- The objectives of the course are to introduce students to the many facets of Oceans, such as, evolution of the oceans, physical and chemical properties of sea water, atmospheric and oceanographic circulation, the fascinating world of marine life and the characteristics of marine environment and the impact of man on the marine environment.

UNIT-I 20 HRS	Nature and scope of Oceanography; Distribution of land and water; Major features of ocean basins; Marine sediments. Physical and chemical properties of sea water.
UNIT-II 20 HRS	Interlink between atmospheric circulation and circulation pattern in the oceans, surface currents, thermohaline, waves and tides.
UNIT-III 20 HRS	Marine biological environment : Bio geochemical cycle in the ocean, biozones, types of organisms, plankton, nekton and benthos, food and mineral resources of the sea. Major marine environments: coastal : estuary, deltas, barrier island, rocky coasts : Open : reefs, continental shelf, continental slope and deep : Pelagic environment and floor of the ocean basins.
UNIT-IV 20 HRS	Impact of Humans on the marine environment. Law of the seas, exclusive economic zone; marine deposits and formation of coral reefs.

SUGGESTED READINGS

1. Davis Rechard J.A.: "Oceanography-An introduction to the Marine Environment". Wm. C. Brown Iowa, 1986
2. Duxbury, C.A. and Duxbury B.: An Introduction to the world's Oceans C. Brown, Iowa 2nd ed., 1989
3. Garrison, T.: "Oceanography - An Introduction to Marine Science" Books/Cole, Pacific Grove, USA, 2001
4. Gross, M. Grant: Oceanography, a View of the earth, prentice-Hall inc. New Delhi, 1987
5. King C.A.M. Oceanography for Geographers 1962
6. Sharma, R.C. "The Oceans" Rajesh N. Delhi, 1985
7. Ummerkutty A.N.P. Science of the Oceans and Human life, NBT, New Delhi, 1985
8. Ommany, F.D.: The Ocean
9. Sharma, R.C. & M. Vital: Oceanography: A Brief Introduction Kisalya Pub. New Delhi
10. Siddartha, K.: Oceanography: A Brief Introduction, Kisalya Pub. New Delhi
11. Lal D.S. (2009) Jalvayu evam Samudra Vigyan, Sharda Pustak Bhavan Allahabad
12. Negi, B.S. (1996) Jalvayu Avam Samudra Vigyan, Kedarnath Ramnath Meerut
13. Savindra Singh - Samudra Vigyan, Prawalika Publication, Allahabad.

M.A. in GEOGRAPHY
(SECOND SEMESTER)

COURSE CODE : SEC 201 COURSE TYPE ECC/CS

COURSE TITLE: SOCIAL OUTREACH AND SKILL DEVELOPMENT

CREDIT : 04	HOURS : 60
THEORY : 04	THEORY : 60

MARKS : 100
THEORY : 80 CCA : 20

MARKS

TOTAL : 100 (THEORY 30+ PRACTICAL/RAEPORT) PRACTICAL/REPORT : 70

OBJECTIVE

The aim of the project work or field work is to introduce student with the research methodology in the subject and to prepare them for the pursuing in theoretical, experimental or computational areas of the subject.

1- SOCIAL OUTREACH-

ANY ONE VILLAGE OR TOWN/CITY

AREA ANALYSIS & REPORT/PROJECT MAKING

M.A. in GEOGRAPHY
(SECOND SEMESTER)

COURSE CODE : GEO 801	
COURSE TITLE : ENVIRONMENTAL AND FOREST LAWS	COURSE TYPE : BOOK
CREDIT: 06	
THEORY: 06	HOURS: 90
MARKS: 100	THEORY: 90
THEORY: 80 CCA: 20	

OBJECTIVE:

- Understands the concept and place of research in concerned subject
- Gets acquainted with various resources for research
- Becomes familiar with various tools of research
- Gets conversant with sampling techniques, methods of research and techniques of analysis of data
- Achieves skills in various research writings
- Gets acquainted with computer Fundamentals and Office Software Package

UNIT – I
18 Hrs

EVOLUTION OF FOREST AND WILD LIFE LAWS

a) Importance of Forest and Wild life
b) Evolution of Forest and Wild Life Laws
c) Forest Policy during British Regime
d) Forest Policies after Independence
e) Methods of Forest and Wild life Conservation

UNIT – II
18 Hrs

FOREST PROTECTION AND LAW

a) Indian Forest Act, 1927
b) Forest Conservation Act, 1980 & Rules thereto
c) Rights of Forest Dwellers and Tribal
d) The Forest Rights Act, 2006
d) National Forest Policy 1988

UNIT – III
18 Hrs

WILDLIFE PROTECTION AND LAW

a) Wild Life Protection Act, 1972
b) Wild Life Conservation strategy and Projects
c) The National Zoo Policy

UNIT - I
15 Hrs.

CHAPTER – BASIC CONCEPTS

a. Meaning and definition of environment
b. Multidisciplinary nature of environment
c. Concept of ecology and ecosystem
d. Importance of environment
e. Meaning and types of environmental pollution.
f. Factors responsible for environmental degradation.

CHAPTER– INTRODUCTION TO LEGAL SYSTEM

a. Acts, Rules, Policies, Notification, circulars etc
b. Constitutional provisions on Environment Protection
c. Judicial review, precedents
d. Writ petitions, PIL and Judicial Activism

CHAPTER – LEGISLATIVE FRAMEWORK FOR POLLUTION CONTROL LAWS

a) Air Pollution and Law
b) Water Pollution and Law
c) Noise Pollution and Law

UNIT - II
15 Hrs.

CHAPTER- LEGISLATIVE FRAMEWORK FOR ENVIRONMENT PROTECTION

a) Environment Protection Act & rules there under
b) Hazardous Waste and Law
c) Principles of Strict and absolute Liability
d) Public Liability Insurance Act
e) Environment Impact Assessment Regulations in India

CHAPTER – ENVIRONMENTAL CONSTITUTIONALISM

a. Fundamental Rights and Environment
   i) Right to Equality .....Article 14
   ii) Right to Information .....Article 19
   iii) Right to Life .....Article 21
   iv) Freedom of Trade vis-à-vis Environment Protection
b. The Forty-Second Amendment Act
c. Directive Principles of State Policy & Fundamental Duties
d. Judicial Activism and PIL

M.A. in GEOGRAPHY
(SECOND SEMESTER)

COURSE CODE:	GEO [illegible]	COURSE TYPE	[illegible]
COURSE TITLE:	BIO GEOGRAPHY		
CREDIT: [illegible]		HOURS: [illegible]	
THEORY: [illegible]		THEORY: [illegible]	
MARKS: [illegible]			
THEORY: [illegible]	CCA : [illegible]		

OBJECTIVE : To introduce the student the concept of Biogeography and its vegetation, information and their application; interaction between living organisms with climate and physical environment, with special reference to India.

UNIT 1 [illegible]	1. **Essentials of Biogeography** 1.1 Biogeography: nature, scope and contents 1.2 Approaches to the study of biogeography 1.3 Significance of biogeography and its relation to other disciplines 1.4 Recent trends and relevance in the present day situation
UNIT 2 [illegible]	Spatial Dimensions in Biogeography 2.1 Factors influencing distribution of flora and fauna 2.2 Concept of biogeographical regions and realms; biomes 2.3 Patterns of distribution of world vegetation
UNIT 3 [illegible]	**Dynamic biogeography** 3.1 Dispersal and migration in plants 3.2 Migration of animals: types and causes – case studies 3.3 Concept of Biogeographical barriers – types 3.4 Concept of succession and climax 3.5 Theory of Island Biogeography
UNIT 4 [illegible]	Soils and Biomes 4.1 Soil forming processes and soil properties, global distribution of soi[illegible] 4.2 Soil profile – its relation to climate and vegetation 4.3 Vegetation and soils of India 4.4 Major biomes of the world – Tropical and Temperate Forests and Grasslands, Hot and Cold Deserts, Mediterranean, , Mangroves

SUGGESTED READINGS

1. Akin, W.E. (1991), 'Global patterns – Climate, Vegetation and Soils', University of Oklahoma Press, U.S.A.
2. Bharucha, F.R. (1993), 'A Textbook of Plant Geography of India', Oxford University press, Bombay
3. Brown, J. H., &A. C. Gibson, (1983), 'Biogeography', St. Louis, Mosby, MO.
4. Brown, J.H. and Lomolino, M.V. (1998); Biogeography, Second Edition, Sinauer Associates, Inc. Sunderland, Massachusetts.
5. Collinson, A. S. (1972) Introduction to World Vegetation, George Allen and Unwin.
6. Cox, C.B., Moore, P.D. (2010); Biogeography – An Ecological and Evolutionary Approach, 8thed., John Wiley and Sons, USA.
7. Diksit, K.R. (1991); Environment, Forest Ecology and Man in the Western Ghats – The Case of Mahabaleshwar Plateau, Rawat Publ., New Delhi.
8. Forey, P.A. and Newey, W. W. (1993); Geography of the Biosphere, Butterworth and Co. Ltd., London.
9. Singh Savinder (2007) Environmental Geography (Hindi) Prayag Pustak Bhavan Allahabad
10. Prasad Gayatri and R. Nautiyal (2009) Environmental Geography (Hindi) Sharda Pustak Bhavan Allahabad.