

# Amar Sewa Mandal's KAMLA NEHRU MAHAVIDYALAYA SAKKARDARA SQUARE, NAGPUR 440024 RE-ACCREDITED WITH 'A<sup>+</sup> ' GRADE BY NAAC



**Proposal for Financial Assistance** 

"Submission of Application under the Strengthening Component for Star College Scheme"

> Submitted by Dr. Ashok I. Kamble Principal July 2019

LATE GOVINDRAO WANJARI Founder



DR. (Smt.) SUHASINI G. WANJARI President

Adv. ABHIJIT G. WANJARRI Secretary

DR. ASHOK KAMBLE Officiating Principal

### AMAR SEWA MANDAL'S

(Regd. No. M/220/78 NGP) F-2299 (N)

## KAMLA NEHRU MAHAVIDYALAYA

(ARTS, COMMERCE & SCIENCE) SAKKARDARA CHOWK, NAGPUR - 440 024 Ph : (0712) 2747853, 2747854, 2742308, 2749784 Fax - (0712) 2747853 'A<sup>+</sup>' Grade Reaccredited by NAAC E-mail : kncnag@rediffmail.com Website : www.kamlanehrucollege.ac.in

Date: 02/07/2019

KNM /\_

To.

Dr. Garima Gupte Programme Officer Star College Scheme of DBT Department of Biotechnology Ministry of Science and Technology Block-2, 6 to 8<sup>th</sup> Floor, CGO Complex Lodhi Road

New Delhi-110003

Subject:- Submission of Proposal for 'STAR COLLEGE' Scheme in Life Sciences

Respected sir

With reference to the above subject, we are submitting herewith a proposal in prescribed format of Department of Biotechnology in 4 hard copies and a soft copy.

Our college is reputed in East Nagpur for education in Life Sciences and it has been re-accredited 'A' grade by NAAC, approved by State Government of Maharashtra and affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur. The college is under 2F and 12B of UGC act.

Kindly accept our proposal for further processing. Thanking you

Yours Sincerely (Dr. Ashok I. Kamble) Principal Officiating Principal Kamla Nahru Mahavidyalaya Nagpur.

# KAMLA NEHRU MAHAVIDYALAYA

### SAKKARDARA SQUARE, NAGPUR 440024 RE-ACCREDITED WITH 'A<sup>+</sup>' GRADE BY NAAC

## **Proposal for Financial Assistance**

"<u>Submission of Application under the Strengthening</u> <u>Component for Star College Scheme</u>"

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### <u>Proforma for submission of Application under the Strengthening component for Star</u> <u>College Scheme</u>

### PART-A:

### Information about Existing Facilities and Programs:

Sl.	Parameter	Sub-Parameter			
110.	Section-A: General Information				
A-1	Name of the College	Kamla Nehru Mahavidyalaya			
A-2	Nature of the College	Private			
	(Government, Private,				
	Autonomous)				
A-3	Whether registered under	Yes			
	12(b) and $2(f)$ of the UGC?				
	Please enclose Documentary				
	Evidence.				
A-4	If Private/ NGO/Autonomous				
	– Darpan ID to be provided	MH/2017/0157006			
	(as per details of NITI Aayog)				
A-5	Application Status	a) Fresh $$			
		b) Rejected after Screening			
		(date of rejection letter)			
		c) Rejected after Presentation			
		(date of rejection letter)			
		d) Completion of One Tenure of Support			
		(date of discontinuation)			
		If (d) and (a) shows is applicable then			
		i) Whather the college has dedicated using			
		for Biotechnology			
		ii) No. of specialised training programme			
		for faculty			
		iii) No. of faculty participated			
		iv) No. of students opting/opted for			
		PG courses			
		v) No. of SOPs created/ kits for practical			
A-6	Complete Postal Address with	Kamla Nehru Mahavidyalaya,			
	Pin-Code	Sakkardara Square, Umrer Road, Nagpur-440024			
A-7	Name of the <b>Principal</b>	Dr. Ashok I. Kamble			
	Telephone No. with STD	0712-2747853			
	Code	9822461593			
	Mobile number	07122747853			
	Fax No.	kncnag@rediffmail.com			
	E-mail	www.kamlanehrucollege.ac.in			
	Website (URL)				
A-8	Location of College	f) Urban $$			
	(Please enclose documentary				
	evidence duly signed by	g) Rural			
	Competent Authority)				
		h) Tribal			

		-		
A-9	Age of the College	a) 10-25 years □ b) 26-50 years √ c) 51-75 years □		
		d) 76-100 years		
A-10	Affiliated to which University	Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.		
A-11	Status about Affiliation	a) Permanent $$		
		b) Temporary		
A-12	Name of Department for	Department:- Biotechnology		
	which the support is being sought under the Star College	a) Name of Degree Course B.Sc.		
	Scheme (Subject wise)	01/07/2003		
	Name of Contact Person from	Dr. Sandhya R. Moghe		
	each department	a) Designation : Assistant Professor		
		Sakkardara Square, Umrer Road, Nagpur-440024		
		c) Phone : 9860952677		
		Email : sandhyamoghe4@gmail.com		
		Department:- Microbiology		
		a) Name of Degree Course B.Sc.		
		01/07/2003		
		Dr. Anita M. Chandak		
		a) Designation : Assistant Professor		
		Sakkardara Square, Umrer Road, Nagpur-440024		
		c) Phone : 9822731866		
		Email : anitachandak@gmail.com		
		Department:- Chemistry		
		a) Name of Degree Course B.Sc.		
		01/07/1989		
		Dr. Sunita M. Gadegone		
		a) Designation : Associate Professor b) Complete Address · Kamla Nehru Mahavidyalaya		
		Sakkardara Square, Umrer Road, Nagpur-440024		
		c) Phone : 9325239593		
		Email : sunita.gadegone@gmail.com		

		Department:- Physics
		a) Name of Degree Course B.Sc.
		b) Date of start of Course 01/07/1989
		Prof Vandana Kharahe
		a) Designation · Associate Professor
		b) Complete Address : Kamla Nehru Mahavidvalava.
		Sakkardara Square. Umrer Road. Nagpur-440024
		c) Phone : 7709118666
		Email : vandana_kharabe@yahoo.com
		Department:- Electronics
		a) Name of Degree Course B.Sc.
		b) Date of start of Course $01/07/1989$
		01/07/1385
		Dr. Pradeep B. Dahikar
		a) Designation : Associate Professor
		b) Complete Address : Kamla Nenru Manavidyalaya,
		Sakkardara Square, Unifer Road, Nagpur-440024
		C) Flidle . 9650545754 Email : phdahikarns@rediffmail.com
		Eman : podankarns@redniman.com
A-13	Name of <b>Programme</b>	Dr. Pradeep B. Dahikar
	Coordinator for Star	a) Designation : Associate Professor
	College Scheme (DBT shall	b) Complete Address : Kamla Nehru Mahavidyalaya,
	correspond with	Sakkardara Square, Umrer Road, Nagpur-440024
	Principal/Coordinator)	c) Phone : 0712-2747853
		d) Email : <b>pbdahikarns@rediffmail.com</b>
<u> </u>		e) Mobile No: 9850343734
Section	I-B: Infrastructure	
B-1	Laboratories (details for	Department Total expenditure
	proposed departments)	during the past three years
		1. List of equipment
		2. Name
		3. No. <u>Annexure-1</u>
		4. Year of purchase
B-2	Library	a) Are there separate departmental libraries other than
		the Central Library
		Yes
		No L
		b) Indicate total Amount spent during the last three $P_{0} = 050000 (c) (c)^{-1}$
		years - KS. 95,000.00 /- (all the books are donated
B-3	Computer Internet Facility	Yes/ <del>No</del>
B-4	a) No. of Lecture Halls	31
	b) No. of Laboratories	05
Section	-C: Faculty	L
C-1	Details about Teachers in each	a) Number, Name
	participating Department	b) Permanent

		c)	Temporary Annexure-II
		d)	Part Time
		e)	Adhoc/Re-employed
		f)	Qualification(MSc/MPhil, PhD)
		g)	Area of specialization
		h)	List of publications in last five years (only in soft
			copy, if too long)
		i)	R&D projects received from different funding
			agencies indicating title, cost, duration, date of
			sanction, name of funding agencies.
C-2	Details about in service	Nu	imber attended during last five years under the
	training for teachers of	fol	lowing (duration and period) - Annexure-III
	participating departments:	a)	Orientation Course
	Address a) $-$ c) and give		(ASC/ Identified Dept/ College)
	additional inputs, if any	b)	Refresher Course
		c)	Conferences/Symposia/Seminar/Workshop
Section	n-D: Students	T	
<b>D-1</b>	Student Details	a)	Student Statistics for last 5 years- <u>Annexure-IV</u>
			(i) Sl. No.
			(ii) Year
			(iii) No. of seats
			(iv) Mode of selection
			(v) No. of students admitted
			(vi) No. of students passed out
			(vii) Category G, SC, ST, OBC
		• •	(viii) Sex M/F
		b)	Do all students under-take a summer
			training/research project? If yes, what is the
			duration? No. of students in each project.
			No
		()	Provide the list of projects under taken by students in
		0)	last 2 years Anneyure-IV (A)
SECT	ON-E : CURRICULUM		
	Curriculum		Enclose come of our coulum Amoremony V
E-1	Curricululli	a)	List of the prectical experiments in the curriculum
		D)	actually done by the students and practical
			demonstrated Approvume-VI
			When was the last everyise for curriculum revision
		()	undertaken?
			<b>Biotechnology</b> . U.G. 2013-14
			P.G. 2015-16 (CRCS)
			Microhiology: 11 G 2013-14
			P.G. 2015-16 (CRCS)
			<b>Chemistry:-</b> U.G. 2013-14
			P.G. 2015-16 (CBCS)
			Physics:- U.G. 2013-14
			P.G. 2015-16 (CBCS)
			<b>Electronics:-</b> U.G. 2013-14
			P.G. 2015-16 (CBCS)
		d)	Specialization of the course
			Physics: - P.G. Material Science.
			-
		e)	No. of SOP's created Kits for practical : NIL

### PART-B:

#### **Technical Details of the Proposed Program**

1. Half page executive summary indicating relevance and expected outcome.

The institution though located in one of the backward areas of Nagpur, has created to the scientific and technological based learning needs and tempered to students of this part of the city. Since 1989 B.Sc. Courses were then in the core areas of science such as, Chemistry, Physics, Mathematics, computer science and Electronics. But with development in the modern areas of scientific study the college started life sciences courses like Biotechnology, Microbiology, Botany, Zoology, Biochemistry and Environmental Science in the year 2003.

The recent trends in running these courses have to be founded in the coming years to meet the global challenges in this field of learning. Just conducting these courses will not bring about any drastic effect to change the current scenario. Instead a thorough retracting and reframing of the entire execution of practical teaching and learning has to be done. An overall metamorphosis has to be brought about in the teaching and learning practices of the institution. This transition is relevant because:

- Experimental learning in the key
- Modern equipment and instruments are needed
- Research Oriented and project oriented courses have to be fostered
- Latest infrastructural facilities will aid in such learning
- Enhancing faculty improvement and updating
- Promoting and sustaining quality bench mark

The implementation of the above mentioned paradigmatic excellence will aid in ensuring the following outcomes

- Increase research activity
- Strengthen academic and result oriented students and faculty
- Student with "Hands on" Experience
- Rise in employability skill of students
- Enhance contribution to industry, society and country.

We, at Kamla Nehru Mahavidyalaya are committed in offering best opportunities and platform to the students in the field of Science. A special emphasis will be given to imbibe a sense of innovation in bio-technology and other allied areas. Possible measures will be undertaken for promotion of research in bio-technology for societal benefit. A strong industry-academia association will be maintained for socio-economic benefit.

Although research project is not a part of curriculum at undergraduate level, however, students are compelled to undertake small research projects related to their subject specialisation. Thereby leading to increase in their analytical and decision making skills.

#### 2. Specific Objectives (not more than one page).

The objectives of the proposed programs are:-

- Modernization of Laboratories
- Upgradation of Library
- To facilitate students for research work.
- To promote research work for societal benefit.
- To promote biotechnology among the society.
- To provide environmental protection through biosafety.
- To provide platform to generate new products, process and technology.
- To provide consultancy to the students in commercialization of the bio products in market.
- To provide special mentoring to women, rural, SC & ST population and marginalized disadvantage community.
- To provide professional qualification laced with technical skills to the students.
- To provide practical exposure to the students for employability.
- To create healthy industry-department relation.

- To achieve innovation in teaching, learning, research and extension.
- To equip the students with relevant knowledge and competence to face global challenges.
- To develop inquisitiveness in the minds of student.
- Measures to be adopted to enhance bench skills of students, project work, summer training & industrial training (department wise); No. of beneficiaries in each.

Common measures adopted by all departments for enhancing bench skills of students

- Regularly organizing short term skill oriented courses
- To organize industry visits
- To provide summer training at industry and mentor to the students.
- To provide industry training to the students
- Promoting students to participate in various curricular and extracurricular events. Average number of beneficiaries per academic year of each department is given below

Department :- Biotechnology

project work	summer training	industrial training
150	70	70

Department :- Microbiology				
project work summer training industrial training				
150	70	70		

Department :- Chemistry			
project work	summer training	industrial training	
120	100	100	

Department :- Physics				
project work summer training industrial training				
60	25	40		

Department :- Electronics

project work	summer training	industrial training
30	30	30

- 4. Measures to be undertaken to upgrade skills of faculty by participation in faculty improvement programme.
  - To organize industry expertise lectures to keep abreast with latest updated knowledge.
  - To conduct workshops for skill upgradation.
  - To organize National and International seminars and symposium for latest development in the subject knowledge.

- To support and encourage faculties to participate faculty development program.
- Provide financial assistance to faculty members for participating in various workshops, trainings, seminars and conferences etc.
- To organizes certificate courses in department wise.
- To arrange training programme for the students and teachers.
- 5. Appropriate modifications proposed in curriculum to cover laboratory exposure to students and IPR & biosafety issues (details thereof department wise).
  - Most of the faculties from the college working as a member of Board of studies of the University. They will take the cognizance of upgradation of syllabus on regular basis.
  - The suggestions are called online/offline from stake holders and industry people on regular basis.
  - Imparting training on IPR issues for students.

Depart ment Biotech	Existing Practical's in Curriculum Biostatistics	Current Infrastructure/ Instruments • Microscope	Proposed Modification Upgradation of	Proposed Instrumentation • Gel doc
nology	Bioinformatics Environmental Microbiology Plant tissue culture technique Genetic Engineering Protein Estimation	<ul> <li>Plant Tissue culture</li> <li>Reference books/ Journals</li> <li>Bioinformatics software</li> <li>PCR Thermal cycler machine</li> <li>SDS unit</li> <li>Vertical and horizontal electrophoresis unit</li> </ul>	plant tissue culture lab Advance Molecular Biology lab Development of animal cell culture lab	<ul> <li>Cooling centrifuge</li> <li>Co<sub>2</sub> Incubator</li> <li>RT-PCR</li> <li>Deep freezer</li> <li>Microscope with high resolution camera</li> <li>Spectrophotomet er</li> <li>Orbital shaker</li> <li>Bioreactor</li> </ul>

Department	Existing Practical in Curriculum	Current Infrastructure/ Instruments	Proposed Modification	Proposed Instrumentation
Microbology	1) Identification of Microorganis m	Compound Microscope	Microbial Characterization	Binocular Research Microscope
	<ul> <li>2) Production         <ul> <li>of</li> <li>Biofertilizer</li> <li>By Nitrogen</li> <li>Fixing</li> <li>Bacteria</li> </ul> </li> </ul>	Incubator	Isolation of Nitrogen Fixing Bacteria	Basic Fermenter
	3)Isolation of DNA	Colorimeter	Separation and Isolation of Chromosomal and Plasmid DNA	Vertical And Horizontal Gel Electrophoresis Unit
	4)Determination of Phenol Coefficient	Autoclave	Serial Dilution of Phenol and Given Disinfectant	UV- Transilluminator

Departme nt	Existing Practical's in Curriculum	Current Infrastructur e / Instruments	Proposed Modification	Proposed instrumentation
Chemistry	<ul> <li>Preparation of Inorganic complexes</li> <li>introduction to TLC</li> <li>Titration to determine amount of strong acid using conductomet er (Demo)</li> <li>Purification of organic compounds</li> <li>(recrystallisat ion)</li> </ul>	<ul> <li>Microwave</li> <li>TLC plates</li> <li>UV Spectrophot ometer (single wavelength)</li> </ul>	<ul> <li>Determination of Vitamin C in Lemon</li> <li>Estimation of food additives in food sample</li> <li>Hands on use of a conductometer to determine acid content</li> <li>Ion exchange Method</li> <li>Introducing Column Chromatography</li> </ul>	<ul> <li>Digital pH meter</li> <li>Mono pan Balance</li> <li>TLC Plates</li> <li>Potentiometer</li> <li>Conductometer</li> <li>r</li> <li>Spectrophoto meter</li> <li>Rotary vacuum evaporator</li> </ul>

Departme	Existing	Current	Proposed	Proposed
nt	Practicals in	Infrastructure/	Modification	Instruments
	curriculum	Instruments		
Physics	1. Dielectric	1. Dielectric	1. Rydberg	1. Blood
	constant	constant	constant for	pressure
	measurement	apparatus	hydrogen	measuring
	2. Study of hall	2. Hall effect	2. Determination	digital
	effect	apparatus	of	instrument.
	3. Measurement	3. Four probe	concentration	2. Lorentz Half
	of	apparatus	of sugar	shed
	conductivity	4. CRO	solution by	polarimeter
	of		polarimeter	3. Digital pH
	semiconducto		3. Determination	meter
	r using four		of pH value of	4. GSR
	probe		amino acids	5. Thermister
	apparatus		4. Measurement	probe
	4. Study of		of Blood	
	Lissajous		pressure (BP)	
	figures using		5. Measurement	
	CRO		of body	
			temperature	
			using GSR &	
			thermister	
			probe	
			6. Measurement	
			of skin	
			resistance	
			using GSR	

Department	Existing Practical's in Curriculum	Current infrastructural / instruments	Proposed Modification	Proposed instrumentation
Electronics	Application	Digital	Visual	DSO, Signal
	developed by OP-	Multimeter, CRO	representation of	generator
	Amp based.		Signal	

6. Techniques to be included for hands on training to students (department wise); No. of beneficiaries in each.

Department	Add on	Skill Based	Faculty	No. of
	Programmes	Programmes	Knowledge	beneficiaries
			Enhancement	
			Programmes	
	Basic animal cell	Technique in	Chick fibroblast	50
	culture	animal cell culture	culture	
	techniques		Visit to various IVF	
Distantian also			centre	
Biotechnology	Various techniques in	Advance technique	Transformation	50
	techniques in	in plant tissue	technique	
	Plant	culture		
	biotechnology			

Department	Add on	Skill Based	Faculty Knowledge	No. of
	Programmes	Programmes	Enhancement	Beneficiarie
			Programmes	S
	Immunological		Microscopic	
Microbiolog	Techniques	Recombinant DNA	Techniques	50
У	Techniques In	Technology	Basic	
	Microbiology		Bioinformatics	50

Department	Add on	Skill Based	Faculty	No. of
_	Programmes	Programmes	Knowledge	beneficiaries
	_		Enhancement	
			Programmes	
	Visits to National	Basic Course in and	Advanced	60
Chemistry	Laboratories and	Analytical	technique in	
_	Industries	techniques	Analytical	
			techniques	

Department	Add on programmes	Skill based programme	Faculty knowledge enhancement	No. of beneficiaries
			programmes	
Physics	<ol> <li>Nano science &amp; Nanotechnology</li> <li>Biophysics</li> </ol>	<ol> <li>Repairing of home appliances</li> <li>Solar equipment maintenance</li> </ol>	<ol> <li>C<sup>++</sup> programming</li> <li>Learning course on MOOCS</li> </ol>	40

Department	Add on	Skill Based	Faculty	No. of
	Programmes	Programmes	Knowledge	beneficiaries
			Enhancement	
			Programmes	
Electronics	Embedded System	IOT based	Raspberry Pi based	45
	basic and 8051	application in	instrumentation &	
	microcontroller	Biomedical	Python	
	interfacing	instrumentation	programming.	
		PLC & SCADA		

- 7. Proposed activities for laboratory staff.
  - Training related to the laboratories instruments
  - Workshop of handling Glassware and laboratories Chemicals
  - One day workshop of Minor Instruments in the laboratory.
- 8. Involvement of visiting faculty (details of lecture & practical to be covered in each department).

Department	Papers and	Papers/Experiments In	Faculty Expertise
	Experiments in	Proposed	
	Current Curriculum		
	Nanobiotechnology For Drug Designing & Delivary	Nanotechnology For Agriculture	Dr. S.D. Moghe
Biotechnolog y		Analysis Of Gene Expression	Dr. S.L. Tiwari
	Drug Designing Using Bioinformatics Tools	Isolation Of Nanoparticals From Biomaterial	Dr. S. L. Tiwari
		RT-PCR	Mr. N.V. Burade

Department	Papers and	Papers/experiments in	Faculty Expertise
	experiments in	proposed	
	current curriculum		
	Mologular biology	Hands on training for SDS-	Ms. Minal
	Wolecular biology	PAGE	Deolekar
	Immunological	1) Western Plotting	Ms. Minal
Microbiolog	techniques	1) western Blotting	Deolekar
У		2) Antigen Antibody reaction,	Ms. Ashwini
		WIDAL test	Kasulkar
	Industrial	2) Piercenter techniques	Ms. Ashwini
	Microbiology	5) Dioreactor techniques	Kasulkar

Department	Papers & Experiments	Papers/ Experiments in	Faculty Expertise
	in current Curriculum	Proposed	
Chemistry	Preparation of polymer	Preparation and determination of electrical conductivity of co- ordination polymer	Dr. Mrs. S. M. Gadegone
	Preparation of Inorganic complexes	Introducing Microwave Synthesis	Dr. W. B. Gurnule

Measurements of EMF of Daniel Cell	Calculation of Transport Number by Moving Boundary Method	Dr. Mrs. M. S. Wagh
Ion Exchange Method	Separation of metal mixtures	Dr. W. B. Gurnule
Purifications of organic compounds (recrystalisation)	Introducing column Chromatography	Dr. Mrs. S.M.Gadegone

Department	Papers & Experiments in	Papers/Experiments in	Faculty Expertise
	current curriculum	proposed	
Physics	Semester I	1. Rydberg constant for	1. Mrs. Vandana
	Paper I	hydrogen	Kharabe
	Properties of Matter and	2. Determination of	2. Dr. S.A. Bhagat
	Mechanics	concentration of	3. Dr. S. P.
	Paper II	sugar solution by	Puppalwar
	Electrostatics, Time	polarimeter	4. Dr. D.S.
	varying fields & Electric	3. Determination of pH	Badwaik
	Currents	value of amino acids	5. Dr. A.P.
	Semester II	4. Measurement of	Mahajan
	Paper I	Blood pressure (BP)	
	Oscillations, Kinetic	5. Measurement of body	
	theory of gases and	temperature using	
	Thermodynamics	GSR & thermister	
	Paper II	probe	
	Gravitation, Astrophysics,	6. Measurement of skin	
	Magnetism and	resistance using GSR	
	Magnetostatics		
	Semester III		
	Paper I		
	Sound waves, Applied		
	acoustic, Ultrasonic and		
	Power supply		
	Paper II		
	Physical optics and		
	Electromagnetic waves		
	Semester IV		
	Paper I		
	Solid state physics, X-Ray		
	and Lasers		
	Paper II		
	Solid state electronics and		
	Molecular physics		
	Semester V		
	Paper I		
	Atomic physics, Free		
	electron theory and		
	Statistical physics		
	Paper II		
	Quantum Mechanics,		
	Nanomaterials and		
	Nanotechnology		
	Semester VI		
	Paper I		

Relativity, Nuclear physics	
and Biophysics	
Paper II	
Electronics, Fiber optics,	
Communication and	
Digital electronics.	

Dept.	Papers & Experiments in	Paper/ Experiments in Proposed	Faculty Expertise
	current curriculum		
Electronics	SEM III	Optical fiber ,Microwave	Dr. Ashish Rewatkar
	unit I	&Basic of Satellite	Asst Prof. P.B.
	Electronic Circuit	communication	Sakhare
	Design		

9. Additional practical proposed to be undertaken by the college (within prescribed curriculum of the university), practical which could not be conducted earlier due to lack of equipment or costly consumables. New equipment proposed to be purchased to be correlated with new additional practical.

#### **Department:- Biotechnology**

Experiments related to 1) animal cell culture could not possible due to non-availability of animal cell culture facility.

2) Industrial biotechnology practical cannot possible due to unavailability of related instruments and facility

#### **Department:-** Microbiology

Industrial microbiology based experiments could not performed due to non-availability of "Bio-reactor" and "UV-Visible spectrophotometer"

#### **Department:-** Chemistry

The experiments on chemical kinetics and semi micro analysis of rare radicals are unable to carry out due to unavailability of "Thermostat" instruments and very costly chemicals.

#### **Department:- Physics**

The experiment 1) Measurement of body temperature using GSR and thermistor probe
2) Measurement of skin resistance using GSR are unable to perform due to unavailability of "Galvanic Skin Response" instruments.

#### **Department:- Electronics**

In the subject electronics all the existing practical experiment performed on readymade study kits. Now after getting star grant we design and implemented study kits in department then student will performed their practical on their kits. In three years of period all the practical experiment kit will be replaced by student made kits. Main requirement for replacing such kit is to have PCB Designing machine and supporting instrument

- 10. Timelines for activities listed at 3-5 in each academic session indicating no. of proposed courses, no. of beneficiaries. Proposed activities time line will be taken in duration of 15 to 30 days in every academic session.
  - For odd session compulsorily every department will execute industrial training program. The time and date will be decided as per continence of industry experts.
  - In the mid-way of the odd session every department will execute industrial visit and if possible the field work will be performed.

- At the end of the even session summer training program will be organized department wise with industry.
- In the January 2020 the department of chemistry will organize an international conference on "Advanced functional materials". All other departments will organize at least one national conference per year.
- Each department will execute one industry lecture in the month of September and December.
- The department of Biotechnology will organize skill based workshop in the month of September.
- Every department will conduct compulsorily one certificate course in any one of the session related to the existing curriculum.
- Every department will make blue print of updating the curriculum and will submit to the university before the end of the even session.

For all the above events and activities the numbers of beneficiaries are 1200

11. Proposed outreach activities for school teachers and college teachers per year.

Biotechnology: Creating awareness of Tissue culture techniques amongst participants.

**Microbiology:** Upgrading basic and advance knowledge of microbiology and creating awareness about diversified detection and prevention techniques in and around institutions

- **Chemistry:** Upgrading the knowledge of Instrumentation and apparatus handling amongst Narayana, St. Paul Schools. To upgrade micro techniques in laboratory experiments.
- **Physics:** Creating awareness of non-conventional energy resources and its need for better future.
- **Electronics:** Awareness about the digital India scheme for the school teachers as well as college teachers. Hands on training of microprocessors (CPU) to the teachers.
- 12. Details of Institutional Ethics Committee, if any.

The constitution of Institutional Ethics Committee:

Chairman: Dr. Ashok I. Kamble

Member: Dr. Pradeep B. Dahikar Dr. Sunita M. Gadegone Dr. Vandana R. Kharabe Dr. Sandhya R. Moghe Dr. Anita M. Chandak

### PART- C: Department wise Budget Requirement: (Put individual table for each Department) (Rs in lakhs)

Sl. No.	I <sup>st</sup> Y	ear		II <sup>nd</sup>	Year		III <sup>rd</sup>	Year	•	Total
Non Recurring (not exceeding ₹10 lakhs)* List of minor laboratory equipment, (per department ) with cost	Equipment Spectrophot ometer Orbital shaker Microscope with camera	cos t 5.0 0 0 0.8 0 0.6 5	Tot al cost <b>6.4</b> <b>5</b>	Equipm ent Cooling centrifu ge Analytic al Balance	cos t 2.5 0 0.5 0	Tot al cost <b>3.0</b> <b>0</b>	Equipm ent Autocla ve	cos t 0.5 0	Tot al cost 0.5 0	9.95
Recurring (consolidat ed, not exceeding ₹3 lakhs)	Chemicals & Stationary	1.5 0	1.5 0	Chemica ls & Stationa ry	0.5 0	0.5 0	Chemica ls & Glass ware	1.0 0	1.0 0	3.00
Total			7.95			3.50			1.50	12.95

#### ✤ Biotechnology

\*Multiple copies of regular use equipments suitable for UG level training is encouraged, please refrain from proposing high cost research based equipments under Star College Scheme.

Sl. No.	I <sup>st</sup> Year			II <sup>nd</sup> Yea	nr		III <sup>rd</sup> Ye	Total		
	Equipment	cost	Total cost	Equip ment	cost	Tota 1 cost	Equip ment	cost	Tota l cost	
Non	Anaerobic System Mark	0.45		Autocl ave	0.25		Electr onic			
Recurrin g (not	Anaerobic Gas Pack	0.23		Bod Incuba	0.56		Weigh ing	0.36		
exceedin g ₹10 lakhs)* List of minor laborator y equipmen t, (per departme nt) with cost	Balance Triple Beam	0.04	3.94	tor Cooke r	0.03	1.25	Machi ne		1.23	
	Cyclomixer	0.02		Centrif uge Machi ne	0.15		Micro pipettt e	0.17		6.42
	Distilled Water Plant	0.05		Ph Meter	0.07		Memb rane Filtrati on Asses mbly	0.13		
	Deep Freezer Vertical	0.74		Magne tic Stirrer	0.04		Resear ch Micros cope	0.15		

### ✤ Microbiology

Total	5.94			1.75			1.73			9.42
Recurrin g (consolid ated, not exceedin g ₹3 lakhs)	Chemicals, Glassware, Kits, and Stationary	2.00	2.00	Chemi cals, Glass ware, Kits, and Station ary	0.50	0.50	Chemi cals, Glass ware, Kits, and Station ary	0.5	0.50	3.00
	Stabilizer Water Bath Cum Shaker	0.30								
	Voltage	0.10								
	Vaccum Pump	0.08								
	Uv Transillumi nator	0.02								
	Power Pack Euro Model	0.38								
	Microwave Oven	0.06								
	Mini Submarine Electrophor sis	0.10								
	Microscope	0.45								
	Laminae Air Flow	0.62								
	Haemoglobi nometer	0.01								
	Hot Plate	0.03								
	Gas Heater	0.01					Elecro phores is Mini Cham ber	0.10		
	Electroblott er Mini Sys.	0.13					Light Micros cope	0.15		
	Disttilation Apparatus	0.12		Incuba tor	0.16		Colori emeter	0.18		

### \* <u>Chemistry:</u>

Sl. No.	I <sup>st</sup>	Year		<b>II</b> <sup>nd</sup>	Year		III <sup>r</sup>	<sup>d</sup> Year	•	Total
Non	Equipmen	cost	Total	Equipment	cost	Total	Equipm	cost	Total	
Recurr	t		cost			cost	ent		cost	
ing	Abbe's			Sovlet						
(not	Refractom	0.60		Apparatus	0.35					
exceedi	eter			Apparatus						
ng < 10	Digital	0.65					Potentio			
lakns)*	Balance	0.05		Muffle	0.60		meter	0.25		
List of	Autominan	0.01		Furnance	0.00		(digital)	0.55		
laborato	Automizer	0.01								
rv	Colorimet			Hydraulic		1.96				
equipm	er(Photoel	0.70		Press	0.72					
ent.	ectric)			Machine						
(per	,						Ion			
departm				Melting			selective	0.61		
ent)	Centrifuge	0.21		point	0.28		Electrod	0.01	2.14	
with				Apparatus			е,			
cost							Fluoride			
	Conductiv	0.25					Shaking	0.60		
	ity Meter	0.25					Machine			
	-						Soxlet			
	Deionizer	0.32					Apparat	0.02		
		0.02					us	0.02		
	Distilled						Conduct			
	water	0.32					ometer	0.36		10.00
	plant		5.90							
	Heating						Die			
	Mantle	0.05					Punch	0.21		
			-							
	Kipp's	0.08								
	Apparatus									
	Ultrasonic	0.01								
	ator	0.21								
	Manadia									
	Magnetic	0.11								
	Suffer		-							
	Nitrogen	0.24								
	Assembly	0.24								
	One pan	0.42								
	Balance									
	Oven	0.24								
	Oven	0.24								
	pH Meter	0.16								
	Polarimete	0.35								
	r	0.55								

	Oil bath	0.08								
	Thermosta t	0.90								
Recurr ing (consoli dated, not exceedi ng ₹3 lakhs)	Chemicals , Glassware & Stationary	2.00	2.00	Chemicals, Glassware & Stationary	0.50	0.50	Chemica ls, Glasswa re & Stationa ry	1.00	0.50	3.00
Total		1	7.90		1	2.46		1	2.64	13.00

## \* <u>Physics:</u>

Sl. No.	I <sup>st</sup> Year			II <sup>nd</sup> Yea	r		III <sup>rd</sup> Year	Tota 1		
	Equipmen t	cost	Tot al cost	Equipm ent	cost	Total cost	Equipmen t	cost	Total cost	
Non Recurring (not exceeding ₹10 lakhs)* List of minor laboratory equipment, (per	E-spin nano- electrospi nning appratus for producing nanofiber s from polymers Hydrolic press	5.50	6.3 0	IC trailer kit Planck' s constan t apparat us pH meter	0.15 0.20 0.15	1.50	Ammeters (1000 uA) Audio Oscillator Cathode Ray Oscillosc ope	0.10 0.25 0.42	2.09	9.89
(per department ) with cost				Rheost ats (100 ohm, 1.2A)	0.10		Digital Multimete r	0.45		
				nce box	0.20		rs	0.10		
				CE kit for charact eristic	0.10		Hydrogen discharge tube	0.02		

				for charact eristic FET kit for charact	0.10		Disc apparatus Analog Multimete	0.10		
				eristic CE amplifi er	0.10		Magnetic stirrer	0.25		
				Zener diode as voltag we regulat or	0.10		Newton's ring apparatus setup	0.20		
				Infrare d lamp (Philips )	0.20		Platinum resistance thermome ter	0.16		
Recurring (consolidat ed, not exceeding ₹3 lakhs)	Chemical s, Glassware & Stationary	0.85	0.8 5	Chemic als, Glassw are & Station ary	0.50	0.85	Chemical s, Glassware & Stationary	1.00	0.85	2.55
Total	7.15			2.35			2.94			12.4 4

### ✤ <u>Electronics:</u>

Sl. No.	I <sup>st</sup> Y	ear		II <sup>nd</sup>	Year		III	<sup>rd</sup> Yea	r	Total
Non	Equipment	cost	Total	Equipme	cost	Total	Equip	cost	Total	
Recurring			cost	nt		cost	ment		cost	
(not	PCB			Electroni			IoTBu			
exceeding	Prototype			c			ilder			
₹10	Machine			Workstat			Lemo			
lakhs)*				ion Test			n			
List of		167		&	1 20			1 1 2		
minor		4.07		Measurin	1.69			1.15		
laboratory				g						
equipment				Laborato						9.94
, (per			5.96	ry		1.99			1.99	
departmen				Solution						
t) with	More than a			Artwork	0.10		GSM			
cost	Multi			table(illu			IoT			
	Instrument			minated)			Gatew			
	(12 in one	0.76					ay	0.22		
	Multi						(SIM			
	Instrument)						Not			
							Includ			

							ed)			
	Double Sided U.V. Exposure Unit ( Proto UV)	0.40					Indust rial Gatew ay	0.36		
	PCB Drafting Aids kit	0.13					Extra Wirele ss Sensor Node	0.29		
Recurring (consolida ted, not exceeding ₹3 lakhs)	Components and stationary	1.12	1.12	Compon ents and stationar y	0.50	0.88	Comp onents and station ary	1.00	1.00	3.00
Total			7.08			2.87			2.99	12.94

<b>Total Budget for all Departments</b>	: 60.75 Lakh
Total Non-recurring	: 46.20 Lakh
Total Recurring	: 14.55 Lakh

M

Signature of Executive Authority of the Institute/University with Seal

n Pgar CS Scanned with CamScanner

Signature of Program Coordinator

Date:

## Annexure- I

## KAMLA NEHRU MAHAVIDYALAYA NAGPUR

## Department wise Total expenditure during the past three years

Sr. No.	Department	Total Expenditure
1	Biotechnology	1642329
2	Microbiology	1262941
3	Chemistry	1610000
4	Physics	545741
5	Electronics	301483

## **DEPARTMENT OF BIOTECHNOLOGY** List of Instruments Purchased during past years

S.No	Name of Instruments	Number	Year of Purchase	Working / Non-working
1	Computer	1	2015	working
2	Monitor	1	2015	working
3	Keyboard	1	2015	working
4	Balance (Digital)	2	2012	working
5	Colorimeter	3	2012	working
6	Stabilizer	1	2012	working
7	Deep Freezer	1	2012	working
8	Microwave Oven	1	2012	working
9	Air conditioner	3	2011	working
10	Large power pack	2	2011	working
11	Transilluminator	2	2011	working
12	Western blotting	2 units	2011	Not working

## **DEPARTMENT OF MICROBIOLOGY** List of Instruments Purchased during past Three years

SR.NO.	Name	Number	Year of	Functional/Not
			Purchase	Functioning
1.	Electrophoresis assembly	02	2016-2017	Functioning
2.	Microscope	05	2016-2017	Functioning
3.	Stage micrometer	02	2016-2017	Functioning
4.	Ocular micrometer	02	2016-2017	Functioning
5.	Refrigerator	01	2016-2017	Functioning

## **DEPARTMENT OF CHEMISTRY**

## List of Instruments Purchased during past Three years

SR.NO.	Name	Number	Year of	Functional/Not
			Purchase	Functioning
1	Conductivity meter	01	2018-2019	Functioning
2	Potentiometer	02	2018-2019	Functioning
3	Water Distilation Plant	01	2017-2018	Functioning
4	Abbes Rereactometer	20	2015-2016	Functioning
5	Distillation water plant	01	2015-2016	Functioning
6	Polarimeter	01	2015-2016	Functioning
7	Viscometer	02	2015-2016	Functioning

## **DEPARTMENT OF PHYSICS**

## List of Instruments Purchased during past Three years

SR.NO.	Name	Number	Year of	Functional/Not
			Purchase	Functioning
1.	Ammeters (1000 uA)	03	2018-2019	Functioning
2.	Audio Oscillator	04	2018-2019	Functioning
3.	Nano Ampere Meter	02	2018-2019	Functioning
4.	Cathode Ray Oscilloscope	01	2018-2019	Functioning
5.	Analog Multimeter	02	2018-2019	Functioning
6.	Digital Multimeter	04	2018-2019	Functioning
7.	Electric Bulb		2018-2019	Functioning
	a. 60 Watt	10	2018-2019	Functioning
	b. 6 Watt	12	2018-2019	Functioning
8.	CRO Chords	2 Pairs	2018-2019	Functioning
9.	Audio Oscilloscope Chords	5 Pairs	2018-2019	Functioning

10.	Digital Multimeter Chords	6 Pairs	2018-2019	Functioning
11.	Analog Multimeter Chords	6 Pairs	2018-2019	Functioning
12.	FET	10	2018-2019	Functioning
13.	Ge Crystal		2018-2019	Functioning
	a. N-Type	01	2018-2019	Functioning
	b. P-Type	01	2018-2019	Functioning
14.	Power Pin	06	2018-2019	Functioning
15.	Platinum Resistance thermometer	02	2018-2019	Functioning
16.	Rheostats (100 ohm)	05	2018-2019	Functioning
17.	CONDENSERS		2018-2019	Functioning
	a. Electrolytic (1000 uF,470 uF)	24(12 Each)	2018-2019	Functioning
	b. Ceramic (0.1uF, 0.4uF)	24(12 each)	2018-2019	Functioning
18.	a. Hook up wire	3 Bundles	2018-2019	Functioning
	b. Banana Pin Wire	0.5 Kg		
19.	Crocodile pairs (small size)	50 Pairs	2018-2019	Functioning
20.	Heaters with chord (Good Quality)	03	2018-2019	Functioning
21.	LED (Red, Yellow, Blue, Green)	100 (25 each)	2018-2019	Functioning
22.	Grating with stand	03	2018-2019	Functioning
23.	Rheostats (100 ohm, 1.5 A)	10	2018-2019	Functioning
24.	Resistance	125	2018-2019	Functioning
	(100 ohm, 1K,10K, 2.2K, 4.7K)	(25Each)		
25.	Transformer		2018-2019	Functioning
	a. (6-0-6) 500 uA	06	2018-2019	Functioning
	b. (12-012) 500uA	06	2018-2019	Functioning
	c. 15V,5A Transformer	03	2018-2019	Functioning
26.	Travelling Microscope	02	2018-2019	Functioning
27.	Voltmeters(10V)	05	2018-2019	Functioning
28.	Vernier Calipers	05	2018-2019	Functioning
29.	Screw Gauge	10	2018-2019	Functioning
30.	Zener Diode		2018-2019	Functioning
	a. 1N4001	100	2018-2019	Functioning
	b. OA79	24	2018-2019	Functioning
31.	Banana Pins(Small size)	20 Pairs	2018-2019	Functioning
32.	Prism Flint Glass (medium size)	03	2018-2019	Functioning
33.	Grating (2500 lines /inch)	01	2018-2019	Functioning
34.	Potentiometer (10K)	20	2018-2019	Functioning
35.	Soldering Rod	05	2018-2019	Functioning
36.	Soldering paste	05	2018-2019	Functioning
37.	Wire Cutter	05	2018-2019	Functioning
38.	Battery Cells		2018-2019	Functioning
	a. 1.5 V	12	2018-2019	Functioning

	b. 9V	12	2018-2019	Functioning
39.	Fuse (1Amp)	12	2018-2019	Functioning
40.	ICs (7400 7486 7404 7402 7432 7408)	5Each	2018-2019	Functioning
41.	IC 741	10	2018-2019	Functioning
42.	IC TL084	05	2018-2019	Functioning
43.	Audio Oscillator	02	2017-2018	Functioning
44.	Battery Cells (1.5V & 9V)	Each 12	2017-2018	Functioning
45.	Capacitors		2017-2018	Functioning
46.	Electrolytic	Each 12	2017-2018	Functioning
	(1 µf, 100µf, 470pf, 1000 µf)			U
47.	Ceramic $(0.1\mu f, 0.47\mu f)$	Each 12	2017-2018	Functioning
48.	Crocodile pins/ Banana pins		2017-2018	Functioning
49.	Chords for		2017-2018	Functioning
50.	Digital Multimeter	05 pairs	2017-2018	Functioning
51.	Analogue Multimeter	05 pairs	2017-2018	Functioning
52.	Audio Oscillator	05 pairs	2017-2018	Functioning
53.	Hook up wire	2 Bundles	2017-2018	Functioning
54.	FET(BFW 10/11)	05	2017-2018	Functioning
55.	IC's (741, 7400, 7402, 7404, 7432, 7486/TL084)	Each 10	2017-2018	Functioning
56.	LED (Different colour including IR)	50	2017-2018	Functioning
57.	Wooden Potentiometer (10 wires)	01	2017-2018	Functioning
58.	Resistances (1K $\Omega$ , 10K $\Omega$ , 4.7K $\Omega$ ,	Each 25	2017-2018	Functioning
	100Ω, 470Ω)			
59.	Transistor (BC147 & BC547/NPN)	Each 24	2017-2018	Functioning
60.	Bread Board	05	2017-2018	Functioning
61.	Magnifying Lense (Reading)	05	2017-2018	Functioning
62.	Ammeter (0-1000HA)	03	2017-2018	Functioning
63.	AC Voltmeter (0-50V)	02	2017-2018	Functioning
64.	Transformer		2017-2018	Functioning
65.	0-12 V, 500 mA	06	2017-2018	Functioning
66.	50 V, 5 A	03	2017-2018	Functioning
67.	Zener diode as a voltage regulator kit	01	2017-2018	Functioning
68.	Zener diode		2017-2018	Functioning
69.	OA 79	12	2017-2018	Functioning
70.	IN4001	50	2017-2018	Functioning
71.	Zener Diode (Voltage Regulator 6V)	12	2017-2018	Functioning
72.	Multimeter Analog	03	2017-2018	Functioning
73.	Prizm (Flint Glass) 32 x 32 mm	03	2017-2018	Functioning
74.	Gratings with stand (15000/5000) lines per inch	03	2017-2018	Functioning

## **DEPARTMENT OF ELECTRONICS**

# List of Instruments Purchased during past Three years

Sr. No.	List of Equipment	No.	Year of Purchase	Functional or not
1	Soldering Iron 15W	3	2018	Functional
2	Soldering Iron 5W	3	2018	Functional
3	Striper	5	2018	Functional
4	IC 7400	50	2018	Functional
5	IC7402	50	2018	Functional
6	IC 7432	50	2018	Functional
7	IC 7404	50	2018	Functional
8	IC 7408	50	2018	Functional
9	IC 7447	10	2018	Functional
10	IC 7448	10	2018	Functional
11	IC 7490	10	2018	Functional
12	IC 7493	10	2018	Functional
13	IC 74193	10	2018	Functional
14	IC 7474	20	2018	Functional
15	IC 7476	20	2018	Functional
16	IC 741	50	2018	Functional
17	IC 555	25	2018	Functional
18	IC 0808 DAC	20	2018	Functional
19	IC 0808ADC	10	2018	Functional
20	Resistor 78Ω	100	2018	Functional
21	Resistor 100Ω	100	2018	Functional
22	Resistor 120Ω	100	2018	Functional
23	Resistor 150Ω	100	2018	Functional
24	Resistor 180Ω	100	2018	Functional
25	Resistor 200Ω	100	2018	Functional
26	Resistor 220Ω	100	2018	Functional
27	Resistor 270Ω	100	2018	Functional
28	Resistor 300Ω	100	2018	Functional
29	Resistor 330Ω	100	2018	Functional
30	Resistor 470Ω	100	2018	Functional
31	Resistor 560Ω	100	2018	Functional
32	Resistor 680Ω	100	2018	Functional
33	Resistor 820Ω	100	2018	Functional
34	Resistor 1kΩ	300	2018	Functional

35	Resistor $1.2k\Omega$	100	2018	Functional
36	Resistor 1.5k $\Omega$	100	2018	Functional
37	Resistor 1.8kΩ	100	2018	Functional
38	Resistor 2.0kΩ	100	2018	Functional
39	Resistor 2.2kΩ	100	2018	Functional
40	Resistor 2.5kΩ	100	2018	Functional
41	Resistor 3kΩ	100	2018	Functional
42	Resistor 3.3kΩ	100	2018	Functional
43	Resistor 3.9kΩ	100	2018	Functional
44	Resistor 4.7k $\Omega$	200	2018	Functional
45	Resistor 5.6kΩ	100	2018	Functional
46	Resistor 6.8lΩ	100	2018	Functional
47	Resistor 8.2kΩ	100	2018	Functional
48	Resistor 10kΩ	300	2018	Functional
49	Resistor 15kΩ	100	2018	Functional
50	Resistor 18kΩ	100	2018	Functional
51	Resistor 22kΩ	100	2018	Functional
52	Resistor 33kΩ	100	2018	Functional
53	Ceramic Capacitor 1000 nF	100	2018	Functional
54	Ceramic Capacitor 100 nF	100	2018	Functional
55	Ceramic Capacitor 10 nF	100	2018	Functional
56	Ceramic Capacitor 1 nF	100	2018	Functional
57	Inductor 1mH	50	2018	Functional
58	Inductor 10mH	50	2018	Functional
59	Inductor 100mH	50	2018	Functional
60	switches push to On	25	2018	Functional
61	Switches toggle	25	2018	Functional
62	Switches small On-Off	25	2018	Functional
63	Switches DPDT	25	2018	Functional
64	PCB (Dot Board) small	20	2018	Functional
65	PCB (Dot Board) Medium	20	2018	Functional
66	PCB (Dot Board) Large	10	2018	Functional
67	Soldering Iron (15 W)	3	2018	Functional
68	Soldering Iron (25 W)	3	2018	Functional
69	Soldering Wire	500g	2018	Functional
70	Carbon Mic	5	2018	Functional
71	Buzzers(Piezoelectric)	5	2018	Functional
72	LED(White)	100	2018	Functional
73	LED(RED) (Simple)	100	2018	Functional

74	LED(Green) (Simple)	100	2018	Functional
75	LED(Yellow) (Simple)	100	2018	Functional
76	LED(Blue)	100	2018	Functional
77	Component Organizer Box	3	2018	Functional
78	Stripper	5	2018	Functional
79	Nose Plier (Taparia)	3	2018	Functional
80	Flat base Plier(Penchis) (Taparia)	1	2018	Functional
81	Flat nose wire cutter	3	2018	Functional
82	Mouse (USB)	5	2018	Functional
83	Keyboard (USB)	5	2018	Functional
84	Tester(Tapria)	2	2018	Functional
85	Full Screw Driver Tool Kit (Mobile toolkit Like)	2	2018	Functional
86	Hook up wire (Red, Black, Green)	1 Bundle each	2018	Functional
87	Dry battery Cells (9V)	50	2018	Functional
88	Pencil Cell 1.5 V	10	2018	Functional
89	PCF 8591 ADC (Serial I2C Protocol)	5	2018	Functional
90	DS 1307 (RTC)	5	2018	Functional
91	LM35 (Temp. Sensor)	10	2018	Functional
92	PCF8574 (I/O Expander)	5	2018	Functional
93	L293d (Motor Driver)	5	2018	Functional
94	DC Motor (Metal With Gear box)	6	2018	Functional
95	Stepper motor (5 Wire)	2	2018	Functional
96	P89V51RD2BN	5	2018	Functional
97	MAX485	5	2018	Functional
98	MAX232	5	2018	Functional
99	ULN2803	10	2018	Functional
100	ULN2003	5	2018	Functional
101	32.768KHz (Crystal)	10	2018	Functional
102	22 pF Capacitor	20	2018	Functional
103	33 pf Capacitor	20	2018	Functional
104	11.0592 MHz Crystal	10	2018	Functional
105	1 Micro F.	10	2018	Functional
106	10 Micro Farad Capacitor	10	2018	Functional
107	DM74LS20 NAND (4 input)	10	2018	Functional
108	7425 NOR Gate (4 input)	10	2018	Functional

109	PSA05-11SRWA	10	2018	Functional
110	8 x 8 Bi-Colour LED Matrix Display	5	2018	Functional
111	Single Stand Connecting Wire Male to Male	50	2018	Functional
112	Single Stand Connecting Wire Female to Female	50	2018	Functional
113	Single Stand Connecting Wire Male to Female	20	2018	Functional
114	X-Bee Pro Module with USB Driver Board	4	2018	Functional
115	ATMEL 8051 Development Board with AT89S52,MAX232 & AVR & 8051 USB ISP Programmer	4	2018	Functional
116	Quad band GSM/GPRS TTL MODULE SIM900 / SIM900A	2	2018	Functional
117	Arduino Uno R3 Board with USB Cable	2	2018	Functional
118	RASPBERRY PI 3 MODEL B INBULT BLUETOOTH AND WiFi	1	2018	Functional
119	8051 Development Board required	10	2017	Functional
120	8051 Programmer required	10	2017	Functional
121	RS232 cables required	10	2017	Functional
122	12V/1A Adaptors required	10	2017	Functional
123	Alphanumeric (16 X 2) LCD required	10	2017	Functional
124	Female to Female Single stand Burg Connecting wires (25 wires per Group) required	250	2017	Functional
125	CMOS battery for RTC required	10	2017	Functional
126	ADC 0804 IC Required	10	2017	Functional
127	DAC 0808 IC Required	10	2017	Functional
128	Study of OpAmp Differetiature	1	2016	Functional
129	Study Kit od Monostable Multivibrature	1	2016	Functional
130	Kit of Colpitts Oscillators	1	2016	Functional

131	Study kit odf Transfer characteristics of Piezi Electri Transducer	1	2016	Functional
132	Biomedical Instrumentation Trainer kit	1	2016	Functional
133	ECG/ EMG Study Experiment	1	2016	Functional
134	DAC 0808 Interface module	2	2016	Functional
135	ADC 0808 Interface module	2	2016	Functional

### Annexure -II

### Details about Teachers in each participating Department

### **Department of Biotechnology**

SR No	a) Name	b) Permanent	c) Temporary	d) Part Time	e) Adhoc/Re- employed	f) Qualification(MSc/ MPhil, PhD)	g) Area of specialization	h) List of publications in last five years (only in soft copy, if too long)	<ul> <li>i)</li> <li>R&amp;D projects received from different funding agencies indicating title, cost, duration, date of sanction, and name of funding agencies.</li> </ul>
1	Dr. Sandhya Moghe	-	-	-	Ad-hoc	Ph.D.	Reproductive Biology		Nil
2	Dr. Sarita Tiwari	-	-	-	Ad-hoc	Ph.D.			Nil
3	Dr. Ashwini Darokar	-	-	-	Ad-hoc	Ph.D.			Nil
4	Mr. Vijay Harode	-	-	-	Ad-hoc	M.Sc.			Nil
5	Mr. Nishant Burade	-	-	-	Ad-hoc	Ph.D.			Nil
6	Dr. Divya Khumbalkar	-	-	-	Ad-hoc	Ph.D.			Nil
7	Ku. Surbhi Anilrao Shinde	-	-	-	Ad-hoc	M.Sc.			Nil
8	Ku. Ashwini Arun Mankar	-	-	-	Ad-hoc	M.Sc.			Nil

h) List of publications in last five	e years (only in	soft copy, if too long)
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S.N	Name of Faculty	Title of the research Paper	Name of Journal	DOI No.	National	International	Impact Factor
		Effect of growth regulator					
	Dr. Sandhya	combination on invitro regeneration	International Journal of				Open
1	Moghe	of Catharanphus roseus.	Life Science.			1	access
		In-vitro Micropropagation in	Kamla Nehru Journal of		1		
			International Journal of		1		
			researches in biosciences				
		In-vitro Regeneration of <i>Psoralea</i>	Agriculture and				Open
		corylifolia",	technology		1		access
		Determination of arsenic extraction		DOI:			
		by Vetiveria zizanioides plant for		10.1080/			
2	Dr.Sarita Tiwari	phytoremediation application	Chemistry and Ecology	02757540.2015.1109080		1	1
		In silico arsenate reductase gene	Online Journal of				Open
		evolution.	Bioinformatics			1	access
		Exploring competence of fluorescent					
	Mrs. Ashwini	pseudomonas spp. for heavy metal	World Journal of				
3	Darokar	tolerance"	Pharmaceutical Research			1	

## Details about Teachers in each participating Department

### **Department of Microbiology**

SR. No	a)	b)	c)	d)	e)	f)	g)	h)	i)
	Name	Permanent	Temporary	Part Time	Adhoc/Re- employed	Qualification(MSc/ MPhil, PhD)	Area of specialization	List of publications in last five years (only in soft copy, if too long)	R&D projects received from different funding agencies indicating title, cost, duration, date of sanction, and name of funding agencies.
1	Dr. Anita Chandak	-	-	-	Ad-hoc	Ph.D.	Industrial Microbiology		Nil
2	Dr. Kshama Murarkar	-	-	-	Ad-hoc	Ph.D.			Nil
3	Aarti R. Dabhekar	-	-	-	Ad-hoc	Msc., B.Ed.			Nil
4	Sonali R.Kumarwar	-	-	-	Ad-hoc	M.Sc.			Nil
5	Ms.Neha A.M.Sheikh	-	-	-	Ad-hoc	M.Sc.			Nil
6	Ashwini V.Kasulkar	-	-	-	Ad-hoc	M.Sc.			Nil
7	Dr. Sangeeta D Bhoyar	-	-	-	Ad-hoc	Ph. D.			Nil
8	Minal A. Deolekar	-	-	-	Ad-hoc	M.Sc., NET			Nil

S.N	Name of Faculty	Title of the research Paper	Name of Journal	DOI No.	National	International	Impact Factor
1	Dr. Anita Chandak	Microbial activity of Lycopene against oral pathogen	World Journal of Pharmaceutical Research,			International	5.99
		Study of Cinnamon oil as natural antimicrobial agent.	International Journal of Researches in Biosciences Agriculture and Technology			International	
	-	Production of Liquid Bio- Fertilizer and to study its effectively on plant growth	International Journal of Agricultural Science and Research (IJASR).			International	4.798
		Lycophene is wonder drug.	World Journal Of Pharmaceutical Research .	10.20959/wjpr20165- 6105		International	6.8
		Optimization of condition for production of prodigiosin by Serratia marcences.	World Journal Of Pharmaceutical Research .	10.20959/wjpr20165- 6102		International	6.8
		Decolourization of synthetic dyes using spent mushroom substrate.	International Journal of Research in Bioscience, Agriculture and Technology.	ISSN 2347 – 517X (Online)		International	
		Biodegradation of Textile dyes, malachite green and congo red by fungi and bacteria.	International Journal of Researchers in Bio Sciences, Agriculture and Technologies			International	
		Microbial Contamination And Preservative Capacity Of Some Brands Of Cosmetic Creams.	International Journal of Research in Cosmetic Science,	http://www.urpjournal s.com		International	1.777.
		Lactic Acid Production By Lactobacillus Spp. Using Vegitable Waste	International Journal of Research in Pure and Applied Microbiology			International	
		Production Of Cellulase From Coconut Coir Waste By Bacillus Subtilis Under Solid State Fermentation	International Journal of Recent Scientific Research	:http://dx.doi.org/10.24 327/ijrsr.2017.0807.045 8		International	6.86
		Production of xylanase from low cost wheat bran, corn cobs and pigeon pea pods waste by isolated fungi under solid state fermentation.	International Journal of Recent Scientific Research (IJRSR)	http://dx.doi.org/10.24 327/ijrsr.2018.0905.208 5		International	6.86
		Antimicrobial activity and minimum inhibitory concentration of <i>Ehretia laevis</i> leaves extracts against different microorganisms.	World Journal of Pharmaceutical Research(WJPR)	<u>10.20959/wjpr201812</u> - <u>12608</u>		International	
2	Dr.Kshama W.Murarkar	Study of protopectinase activity on fruits peels for release of pectin using ruthenium red dye.	International Journal of Recent Trends in Engineering & Research (IJRTER)	10.23883/IJRTER.2017. 3487.BONRJ		International	4.101
		Artificial Neural Network (ANN) and Response Surface Methodology (RSM) of extraction of pectin from sweet lemon peels by microbial protopectinase.	International Journal of Recent Trends in Engineering & Research (IJRTER)	10.23883/IJRTER.2017. 3476.GJOXZ		International	4.101

h) List of publications in last five years (only in soft copy, if too long)

Production of xylanase from low cost wheat bran, corn cobs and pigeon pea pods waste by isolated fungi under solid state fermentation.	International Journal of Recent Scientific Research(IJRSR)	http://dx.doi.org/10.24 327/ijrsr.2018.0905.208 5	International	6.86
Antimicrobial activity and minimum inhibitory concentration of <i>Ehretia laevis</i> leaves extracts against different microorganisms.	World Journal of Pharmaceutical Research(WJPR)	10.20959/wjpr201812 -12608	International	8.074
Blood coagulation properties of khandu chakka( <i>Ehretia laevis</i> )plant leaves.	International Journal of Current Research in Life Sciences.		International	
Antimicrobial activity of flaxseed ( <i>l.usitatissimum</i> ) oil and limestone water against pathogenic microorganisms	World Journal of Pharmaceutical Research(WJPR)	10.20959/wjpr201812 -12671	International	8.074
Details about Teachers in each participating Department

#### **Department of Chemistry**

SR. No	a)	b)	<b>c</b> )	<b>d</b> )	e)	<b>f</b> )	g)
	Name	Permanent	Temporary	Part Time	Adhoc/Re- employed	Qualification(MSc/ MPhil, PhD)	Area of specialization
1	Dr.Sunita M. Gadegone	Permanent	-		-	Ph.D.	Inorganic Chemistry
2	Dr. Wasudeo Gurnule	Permanent	-	-	-	Ph.D.	Inorganic Chemistry
3	Dr. Mamta S.Wagh	Permanent	-	-	-	Ph.D.	Physical Chemistry
4	Dr. Rashmi Dubey	-	-	-	Ad-hoc	Ph.D.	Organic Chemistry
5	Ku . Snehal Ashok Pachare	-	-	-	Ad-hoc	M.Sc., SET	Organic Chemistry
6	Ku. Ankita U. Dhande	-	-	-	Ad-hoc	M.Sc., SET	Organic Chemistry
7	Ku. Uma S. Purohit	-	-	-	Ad-hoc	M.Sc., SET	Organic Chemistry
8	Ku. Lata N. Pardhi	-	-	-	Ad-hoc	M.Sc., SET	Organic Chemistry
9	S N Nagre	-	-	-	Ad-hoc	M.Sc.	Organic Chemistry
10	S G Burade	-	-	-	Ad-hoc	M.Sc.	Organic Chemistry

S.no	Name of Faculty	Title	Name of the Journal	ISSN/ISBN No	Year
1	Dr. S. M. Gadegone	Phocatalytic Degradation of azo dye congo red using Zinc substituted nickel nanoferrite	International Journal of current research Engineering, 1406-1409	2393-8374	2019
2		Antioxidant activity of greenly synthesized photochemical fulgides	International Journal of current research Engineering 219-221	2393-8374	2019
3		Mössbauer, XRD and Thermally Induced Structural Studies on Polyaniline 182 Nanocomposite Material Containing Different Concentration of Magnetite Nanoparticle	International Journal of current research Engineering, 42-45	2393-8374	2019
4		Understanding structure of water by ultrasonic measurement in 10% Ethanol-water solutions of fructose at three different temperatures.	International Journal of current research Engineering, 843-846 2393-		2019

h) List of publications in last five years (only in soft copy, if too lor
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S.N	Name of Faculty	Title of the research Paper	Name of Journal	National	International
1	W. B. Gurnule	Jyotsana Khobragade and W. B. Gurnule, Removal of Toxic Metal ions Using Ion-Binding Copolymer Resin by Batch Equilibrium Technique,	Int. J. Res. Biosci., Agri. & Tech.Vol. V(2), 486-491, (2017).		International
2		W. B. Gurnule and V. S. Bisen, Thermal degradatoion study of copolymer resin derived from 4-Hydroxybenzaldehyde, Phenyl hydrazine and Formaldehyde,	Int. J. Res. Biosci., Agri. & Tech.Vol. V(2), 543-551, (2017).		International
3		Meghna H. Jumde and <b>Wasudeo B. Gurnule</b> , Comparison of PH Study for Humic acid in L- Phenyllanine and Humic acid in Dimethyl formamide by Thin Layer Chromatography,	International journal of Chemical and Physical Science, vol. 6(2), 30-36, (2017).		International
4		Meghna H. Jumde and <b>Wasudeo B. Gurnule</b> , Comparison of pH Study for Humic Acid in L- Phenylalanine and Humic Acid in Dimethylformamideby Using Thin Layer	International Journal of Chemical and Physical Sciences, Vol.6, No,2, Mar-April 2017, Page 30-36.		International

	Chromatography for Separation and Estimation of Heavy Metal Jons		
5	Meghna H. Jumde and <b>Wasudeo B. Gurnule</b> , Thin layer chromatographic separation of Cr(VI), Cr(III), Ni(II), Co(II), Cu(II), Fe(III), Zn(II) and Mo(VI) Toxic Metal ions,	BIONANO FRONTIER 7(6), 2016, 368- 381.	International
6	Charulata S. Makde, Mudrika Ahamed and W. B. Gurnule, Sorption Investigation on The Removal of Toxic Metal Ions From Aqueous Solutions Using Chelating Terpolymer Resin,	Journal of Bionano Frontier, Vol. 10 (2) January - June 2017.	International
7	Rani Mankar, <b>W. B. Gurnule</b> , Investigating The Effect of Nanocomposites on Styrene –Butadiene Rubber By Emulsion Polymerization Method,	Journal of Bionano Frontier, Vol. 10 (2) January - June 2017.	International
8	Meghna Jumde and <b>W. B. Gurnule</b> , Comparative Study of Heavy Metal Ions By Using Thin Layer Chromatography For Humic Acid with L-Histidine And Humic Acid With L-Glysin System	Journal of Bionano Frontier, Vol. 10 (2) January - June 2017	International
9	Santhosh P. Chakole, <b>W. B. Gurnule</b> and Manish Upadya, Synthesis And Characterization of Copolymer Resin Derived From 2,2-, Dihydroxybiphenyl and Propylene Diamine	Journal of Bionano Frontier, Vol. 10 (2) January - June 2017.	International
10	Chetana G. Khohad, <b>W. B. Gurnule</b> and Kiran Vajpay, Synthesis, Characterization And Thermal Analysis of Copolymer Resin Derived From 8- Hydroxyquinoline 5-Sulphonic Acid and Hexamethylene Diamine	Journal of Bionano Frontier, Vol. 10 (2) January - June 2017.	International
11	Narayan Das and <b>W. B. Gurnule</b> , Structural and Thermal Degradation Study of Copolymer Resin Derived From 2,4-Dihydroxy Propiophenone, 1,5- Diaminonaphthalene And Formaldehyde	Journal of Bionano Frontier, Vol. 10 (2) January - June 2017.	International
12	V. R. Bisen, S. S. Rahangdale and <b>W. B. Gurnule</b> , Chelating Copolymer Resin Containing Hydroxybenzaldehyde-Phenyl Hydrazine Group	Journal of Bionano Frontier, Vol. 10 (2) January - June 2017.	International

	And Its Recovery Properties For Copper And Iron		
13	Manish M. Yeole, A. P. Ganorkar, and <b>W. B.</b> <b>Gurnule</b> , Mathematical Modeling of Ion- Exchange Applications of 2-Hydroxy 4- Methoxyacetophenone-Dithiooxamide- Formaldehyde Resin-II	Journbal of Bionano Frontier, Vol. 10 (2) January - June 2017.	International
14	R. H. Gupta, <b>W. B. Gurnule</b> and Preeti Mishra, Electrical Conductance Studies of o-Aminophenol - Melamine-Formaldehyde Copolymer-II	Journal of Bionano Frontier, Vol. 10 (2) January - June 2017.	International
15	Deepti B. Patle and W. B. Gurnule, Eco-Friendly Synthesis, Characterisation, Morphology and Ion exchange Properties of Terpolymer Resin Derived from p-Hydroxybenzaldehyde,	Arabian J,. Chem., 9, S648-S658, (2016).	International
16	Abdul R. Burkanudeen, Mohamed A. Riswan Ahamed, Raja S. Azarudeen, M. Shabana Begum and Wasudeo B. Gurnule, Thermal degradation kinetics and antimicrobial studies of terpolymer	Arabian Journal of Chemistry, 9, S296– S305, (2016).	International
17	Meghna H. Jumde and W. B. Gurnule, Thin Layer Chromatographic Separation of Cr(VI), Cr(III), Ni(II), Co(II), Cu(II), Fe(III), Zn(II) and Mo(VI) Toxic Metal Ions,	Res. J. Pharm. Bio. Chem. Sci., 7(6), 368- 381 ( 2016).	International
18	Meghna H. Jumde and W. B. Gurnule, Chromatographic separation of Toxic Heavy Metals ions on Silica Gel-G,	Proceeding of NCARTS, (2016).	International
19	Meghna H. Jumde and W. B. Gurnule, Seperation and Identification of Toxic Heavy metal ions by Thin Layer Chromatography,	Inter. J. Adv. Sci. Engg. Tech. 52-56 (2015).	International
20	Meghna H. Jumde and W. B. Gurnule, Seperation and Identication of Heavy metal ions by thin layer chromatography on silica gel G of Environmental Sambles,	Der Pharma Chemica, 7(10) 409-414 (2015)	International

21	Meghna H. Jumde and W. B. Gurnule, Seperation and Identification of Heavy Metal Ions by Thin Layer Chromatography on Silica Gel_G,	J. chem pharma. Res. 7(4), 889-895 (2015).	International
22	Jyostna V. Khobragade, Mudrika Ahamed and W. B. Gurnule, Thermal Degradation and Critical Studies of the Isoconventional Methods of Kinetic Analysis 8-HQ 5-SASF_III Polymer,	Int. J. Res. Biosci. Agri. Techn., Spl Issue 1, 255-266. (2015).	International
23	23. W. B. Gurnule, Jyostna V. Khobragade, Mudrika Ahamed, Synthesis, Spectral, Morphology and Thermal Degradation Kinetics Studies of Copolymer,	Chem. Sci. Rev. Lett., 3(12), 603-607, (2015,).	International
24	M. M. Yeole, Seema Shrivastava and <b>W. B.</b> <b>Gurnule</b> , Synthesis and Characterization of Copolymer Resin derived from 4-Methyl Acetophenone, Phenyl Hydrazine and Formaldehyde,	Der Pharma Chemica, 7(5), 124-129, (2015).	International
25	W. B. Gurnule, Vaishali R. Bisen, Thermodynamic and Kinetics studies of the removal of Zn2+ Ni2+ from their aqueous solution using copolymer resin,	International journal of Trends and Innovative in computing and communication, 3(20. 86-93, (2015).	International
26	W. B. Gurnule, Vaishali R. Bisen and Mudrika Ahamed, Synthesis, Characterization Morphology and Chelation Ion-exchange Properties of a Copolymer Resin-II,	International journal of Trends and Innovative in computing and communication, 3(20. 80-85, (2015).	International
27	W. B. Gurnule, J V. Khobragade and Mudrika Ahamed, Removal of cations using ion-binding copolymer involving 8-Hydroxyquinoline 5- sulphonic acid and Semicarbazide with Formaldeyde by Batch Equilibrium Technique,	J. Chem, Pharm. Res., Vol 6(8), 364-374, (2014,).	International
28	W. B. Gurnule, J V. Khobragade and Mudrika Ahamed, Thermal Degradation Studies of High Performance Copolymer Resin Derived from 8- Hydroxyquinoline 5-sulphonic acid,	Der. Pharm. Chem., Vol 6(5), (2014.)	International

	Semicarbazide and Formaldehyde,			
29	W. B. Gurnule, J V. Khobragade and Mudrika Ahamed, Synthesis, Characterization and Thermal Degradation Studies of Copolymer Resin Derived from 8-Hydroxyquinoline 5-sulphonic acid and Thiosemicarbazide,	Res. J. Pharm. Chem. Biol, Sci., Vol 5(6. ), 2014.		International
30	W. B. Gurnule and V. R. Bisen, Synthesis, Characterization and Thermal Degradation Studies of Copolymer Resin,	Emerging Material Res., Vol. 3(6), 2014.		International
31	V. R. Bisen, <b>W. B. Gurnule,</b> Synthesis, Characterization and themogravimetric studies of Polymer resin derived from 4- hydroxybenzaldehyde and Phenyl hydrazine, Department of Physics, J.M. Patel Arts, Commerce and Scince College, Bhandara.	Proceeding of UGC Sponsored National Conference : ISBN 978-93-81432-62-4, 58- 64 , 2014. (PP-11)	National	
32	W. B. Gurnule, Electrical Conductance studies of 4-Hydroxybenzophenone- Biuret – Formaldehyde Coplymer, J.M. Patel Arts, Commerce and Scince College, Bhandara.	Proceeding of UGC Sponsored National Conference : ISBN 978-93-81432-62-4, 71- 77 , 2014.	National	
33	R. H. Gupta, <b>W. B. Gurnule,</b> Thermogravimetric Study of 8- Hydroxyquinoline 5- Sulphonic Acid – Dithiooxamide – formaldehyde Polymer,	UGC sponcered national conference on advance material , Department of Physics, Nabira Mahavidyalaya, Katol: ISBN : 9789381432709, 29-32, 2014.	National	
34	W. B. Gurnule, M. B. Thakre, Synthesis and Semiconducting studies of 2- Hydroxyacetophenone – formaldehyde – melamine copolymer,	UGC sponcered national conference on advance material , Department of Physics, Nabira Mahavidyalaya, Katol: ISBN : 9789381432709, 59-61, 2014.	National	
35	W. B. Gurnule, D. B. Patle, Antimicrobial Studies and Ion Exchange Properties of Copolymer Resin Derived from p-HBBF,	Emerging Material Research , Vol. 3(4), 2014.		International
36	<b>W. B. Gurnule</b> , S. Mandavgade, Electrical Conductance Properties of a Copolymer Resin: Synthesis, Characterization and Its Applications,	Res. J. Pharma. Biol. Chem. Sci., Vol. 5(4) 2014, 737-747.		International

37	W. B. Gurnule, V. R. Bisen, Kinetics of thermal decomposition of Copolymer resin-II derived from 4- hydroxylbenzaldehyde, Phenyl hydrazine and Formaldehyde,	Res. J. Pharma. Biol. Chem. Sci., Vol. 5(4) 2014, 1283-1298.	International
38	S.S. Rahangdale, <b>W.B. Gurnule</b> , Chelation of ion- exchange properties of copolymer resin derived from 2,2 <sup>-</sup> -dihydroxybiphenyl, biuret, and formaldehyde,	Desalination and Water Treatment, Vol.52, 2014, 1-10.	International
39	<b>W. B. Gurnule</b> , Studies of Chelation Ion- Exchange Properties of Terpolymer Resin Derived From 8-Hydroxyquinoline and Dithiooxamide,	International Journal of Researches in Biosciences, Agriculture & Technology, Vol. 1(2) 2014, 376-391	International
40	W. B. Gurnule and M. B Thakre, Thermal Degradation Studies of 8-Hydroxyquinoline, Adipamide and Formaldehyde Copolymer Resin,	Res. J. Pharma. Biol. Chem Sci, Vol 5(20) 2014, 204-213	International

S.no	Name of Faculty	Title	Name of the Journal	ISSN/IS BN No	Year
1	Dr. M.S.Wagh	Reducing Toxic Effect of Seed Drenched Organic Contamination on Germination 168 of Tritium Aestivum (L.) (wheet)	International Journal of current research Engineering	2393- 8374	2019
2		Ultrasonic Studies of Some Water Soluble Amino Acids	International Journal of current research Engineering	2393- 8374	2019
3		Continuous Evaluation system: basics for Everyone	Research Chronicler, 31-33	2347- 503X	2019
4		Formulation & Evaluation of face pack containing natural Soil	Research Directions, 298-301	2321- 5488	2019
5		Comparative cytological study of Trigonella foenum graecum and Brassica compestries'	Journal of Chemical and Pharmaceutical Research, 2016, 8(5):208-213	ISSN : 0975- 7384	2016- 17
6		Effect of chemical fertilizers and Biofertilizers on soil quality in agricultural land near Besa (Vidarbha region), Maharahstra, india. Pg no 8-14	Acta Velit	ISSN 2349- 4476	2016- 18

7	Study of the Effect of Thiosemicarbazides on the Karyotoxicity of Allium Cepa. Pg 79-87	Inter. Journal of Engineering Technology, Management and Applied Sciences	ISSN: 09764- 0678	2016- 19
8	Synthesis of Shampoo Using Mud and Evaluation Of Cleansing Strength	Bio Nano Frontier	ISSN: 09764- 0678	2016- 20
9	Water analysis of three Different Lake Water in Nagpur	Bio Nano Frontier	ISSN: 09764- 0678	2016- 21
10	Molecular Interaction Study Of Terploymer Derived from Salicylic Acid	Bio Nano Frontier	ISSN:097 64-0678	2016- 22

i) R&D projects received from different funding agencies indicating title, cost, duration, date of sanction, and name of funding agencies.

	Sr. No.	Name of Faculty	Title of Project	Cost and Duration of Project	Date of Sanction and Name of funding agency
			Studies on the effect of lodine doning on Electrical		UGC 21 Feb 2012
	1	Dr.Sunita M. Gadegone	Properties of Coordination Polymer and their	1,50,000	F. No. 47-1974/11
			applications	1,10,000/-	(WRO)
					11 Jan 2011
	2		Synthesis of New Organic Polymer and Their		F. No. 39-
	2	Dr. Wasudeo Gurnule	Exchange and Electronic Properties	13,33,175/-	700/2010(SR)
				Duration 2011-2014	UGC
			Study of Acostical parameters of some	1,65,000	
	3	Dr. Mamta S.Wagh	Thisemicarbazide and Thiooxadizines in different	2 years	
-			conditions.	21Feb 2012-21Feb 2014	UGC

## Details about Teachers in each participating Department

#### **Department of Physics**

SR. No	a)	b)	c)	d)	e)	f)	g)
	Name	Permanent	Temporary	Part Time	Adhoc/Re- employed	Qualification(MSc/ MPhil, PhD)	Area of specialization
1	Prof. Mrs.V.R.Kharabe	Permanent	-	-	-	M.Sc., P.G.D.C.Sc.A	Digital Electronics
2	`Dr.S. A. Bhagat	Permanent	-	-	-	M.Sc., Ph. D.	Solid State
3	Dr. S. P. Puppalwar	Permanent	-	-	-	M.Sc. ,Ph. D.	Spectroscopy
4	Dr. D. S. Badwaik	Permanent	-	-	-	M.Sc.,Ph. D.	X-ray, Digital Electronics
5	Dr. A. P. Mahajan	Permanent	-	-	-	M.Sc., Ph. D. SET, GATE	Communication Electronics
6	Mr. Shrikant Suryavanshi	-	-	-	Ad-hoc	M.Sc., SET	Digital Electronics
7	Ku. Pooja Zingare	-	-	-	Ad-hoc	M.Sc., SET	Solid State
8	Ku. Bhagyashri Bangalkar	-	-	-	Ad-hoc	M.Sc., SET	Digital Electronics

#### h) List of publications in last five years (only in soft copy, if too long)

S.N o	Name of Faculty	Title of the research Paper	Name of Journal	DOI No.	Nat ion al	Inter natio nal	Impa ct Facto r
1	Prof.Mrs.V.	Photoluminescence characteristics of Ce And Eu activated MBPO5 $(M = Sr,Ca)$ phosphors	ОРТІК	http://dx.doi.org/1 0.1016/j.ijeo.2015.0 8.090		$\checkmark$	0.8
	K.Klial abe	Synthesis and Characterizaton of MBaBO3 (M =Li/K):Dy/Sm Phosphors	BINANO FRONTIER			$\checkmark$	4.56
2		Tunable luminescence properties and energy transfer in $LaAl_{11}O_{18}$ : Eu, Tb phosphor	J. Bio & Chem Lum	DOI 10.1002/bio.3046		$\checkmark$	1.73
		Fluorescence properties of red-emitting SrYAl <sub>3</sub> O <sub>7</sub> : Eu <sup>3+</sup> nanophosphor	IJLA			$\checkmark$	
		Fluorescence in Eu <sup>3+</sup> activated Na <sub>2</sub> CaMg (SO <sub>4</sub> ) <sub>3</sub> phosphor	J. Bionano Frontier			$\checkmark$	4.56
	Dr. S. P.	Blue-emitting phosphor for near UV-pumped white-light emitting diodes	J. Bionano Frontier			$\checkmark$	4.56
	Puppalwar	Optical properties of Na <sub>2</sub> CaSiO <sub>4</sub> : Dy <sup>3+</sup> phosphor for w-LED	J. Bionano Frontier			$\checkmark$	4.56
		UV Emission In Li <sub>2</sub> CaMg(SO <sub>4</sub> ) <sub>3</sub> :Ce Phosphor For Phototherapy	IJSRST			$\checkmark$	
		An efficient Li <sub>2</sub> SrSiO <sub>4</sub> :Tb <sup>3+</sup> phosphor for solid state lighting	IJCESR			$\checkmark$	
		Efficient energy transfer and fluorescence in SrYAl <sub>3</sub> O <sub>7</sub> : Ce <sup>3+</sup> , Tb <sup>3+</sup> phosphor	J. OPTIK	doi.org/10.1016/j.ijl eo.2018.04.006		$\checkmark$	0.8
3		"The Effect of Mg Substitution on Structural and Dielectric Behiviour of Srcozn Mixed Nano Hexaferrites"	IJSR ISSN (Online): 2319-7064			$\checkmark$	
	Dr. D. S.	"The Structural, Dielectric and AC Conductivity Studies of TiCo Substituted Sr2NiZn Y-Type Hexa Nanoferrites"	IJSR ISSN (Online): 2319-7064				
	Badwaik	"Dielectric Behavior of TiCo Substituted Y-Type Nano- Hexaferrites"	J Bionano Frontier			$\checkmark$	
		"The Structural, Dielectric and AC Conductivity Studies of TiCo Substituted Sr2NiZn Y-Type Hexa Nanoferrrites"	Kamla Nehru Research Journal, Vol. 1,		$\checkmark$		

		"Impact of Zinc Substitution on Structural and Optical Behavior of Mixed Ferrites"	IJCESR ISSN (PRINT): 2393-8374, (ONLINE)		$\checkmark$	
		"Infrared Spectral Studies of TiCo Substituted Ytype Strontium Hexaferrites Synthesized by Sol-Gel Auto combustion Method "	IJCESR, ISSN (PRINT): 2393-8374, (ONLINE)		$\checkmark$	
4	Dr. A. P.	Inhibitive Determination Of Pb (Ii) Ions In Water With Urease Based Amperometric Biosensor	J. Bionano Frontier		$\checkmark$	0.3
	Mahajan	Study Of Pani/Mno Nanocomposites For Applications In Biosensing And Supercapacitors	J. Bionano Frontier		$\checkmark$	0.3

i) R&D projects received from different funding agencies indicating title, cost, duration, date of sanction, and name of funding agencies.

Sr. No.	Name of Faculty	Title of Project	Cost and Duration of Project	Date of Sanction and Name of funding agency
1	Prof. Mrs. V. R. Kharabe	<ol> <li>Synthesis and Chara. of Borate based Phosphor</li> <li>Synthesis and Chara. of Rare Earth Doped BaBPO5, Ba3BPO7, M6BP5O20 Phosphor</li> </ol>	1)36,000 2)47,000	1) 2004-2006 , UGC 2) 47,000, UGC
2	Dr. S. P. Puppalwar	Synthesis and Chara. of Lithium based Phosphors	67,000	2008-2010, UGC
3	Dr. D. S. Badwaik	Synthesis and Chara. of Conductive Polymer Composite Material for Industries and Adv. Tech	75,000	2008-2010, UGC

## Details about Teachers in each participating Department

#### **Department of Electronics**

SR. No	a)	b)	c)	d)	e)	<b>f</b> )	g)
	Name	Permanent	Temporary	Part Time	Adhoc/Re- employed	Qualification (MSc/ MPhil, PhD)	Area of specialization
1	Dr. Pradeep B. Dahikar	Permanent	-	-	-	Ph. D.	Instrumentation
2	Prof. Pravin M. Sontakke	Permanent	-	-	-	M. Sc., NET	Electronics
3	Dr. Ashish K. Rewatkar	-	-	-	Ad-hoc	Ph. D.,SET	Electronics
4	Prof. Pratiksha S. Kuhikar	-	-	-	Ad-hoc	M. Sc., B. Ed.	Electronics
5	Prof. Devidas B. Sonkusare	-	-	-	Ad-hoc	M. Sc.	Electronics
6	Prof. Pratibha Sakhare	-	-	-	Ad-hoc	M. Sc.	Electronics
7	Mrs. Pratiksha Kuhikar	-	-	-	Ad-hoc	M.Sc. B.Ed	Electronics
9	Ku. Pratibha B. Sakhare	-	-	-	Ad-hoc	M.Sc., SET	Electronics

#### h) List of publications in last five years (only in soft copy, if too long)

S.No	Name of Faculty	Title of the research Paper	Name of Journal	Year of publi catio n	National	International	Impact Factor
1	Dr. Pradeep B. Dahikar	RS485 Data Transmitter through GSM Service to Server Database Logger	<i>IOSR Journal of Computer Engineering</i> ( <i>IOSR-JCE</i> ) www.iosrjournals.org <b>Journal</b> Listed UGC sr no 5019, PP 22-27	2016			Impact Factor 4.295
2		Iterative Least Square Polynomial Approximation Method for filtering ECG Signals	European Journal of Advances in Engineering and Technology, 2016, 3(7): Research Article ,Journal Listed UGC47799, p p 65-70	2016			IF 2.85 Indexed
3		A Review of Security Aspects of Online and ATM Transactions in Banking Domain pp 2836- 2840	International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 4, Issue 12, Journal Listed UGC	2016			Indexed
4		A Comprehensive Study on the Significance of Soft Computing in Healthcare Systems	International Journal of Engineering Research & Technology (IJERT), Vol. 4 Issue 02, February-2015 Journal Listed UGC 45539, www.ijert.org, Pp 278-281	2015			Impact factor 4.526, Indexed
5		Design and Implementation of ARM Based advanced Industrial Control and Data Acquisition with Wireless LAN Monitoring	Journal of Embedded SystemsVol. 3, No. 1, 2015, pp 16-20. doi: 10.12691/jes-3-1-3   Research ArticleOPEN ACCESSPEER- REVIEWED, 6106VIEWS,5780DOWNLOADS Journal Listed UGC 2949	2015			Impact factor 0.5
6		An Embedded System for Patient Heartbeat Monitoring	Special Issue of International Journal of Electronics, Communication & Soft Computing Science and Engineering,	2016			Indexed peer reviewed

7	Promoting transportation information system	International journal of software & hardware research in Engineering	2016		Peer Reviewed
8	Design and implementation of Microcontroller based 24 Bit data Acquisition system for Load cell Application	Journal of robotic and Mechatronic Systems, Journal Listed UGC43946	2015		Peer Reviewed
9	Zigbee: A wireless Communication Network	Kamla Nehru Journal Science and Technology, Pp 62 to 66	2016		Peer Reviewed
10	Wireless Heartbeat Patient Monitoring on General Intensive Care Unit	Kamla Nehru Journal Science and Technology, Pp46 to 53	2016		Peer Reviewed
11	Digital Weighing Scale Using Wireless Technology for Cost Standardisation	Kamla Nehru Journal Science and Technology, Pp 55-61	2016		
12	Development of Virtual Experiment on Sequential Logic Circuit	Kamla Nehru Journal Science and Technology, Pp 39-45	2016		
13	Defense degree Evaluation in IDS for ZigBee based WSN by PSO	International E-Journal on Emerging Trends in Science , Technology and Management, <b>Journal Listed UGC</b> 48939	2016		
14	Security Performance and Analysis of Rivest- Shamir-Adleman (RSA) Algorithm for ATM, Transactions	International Journal of Innovative Research in Computer and Communication Engineering, (An ISO 3297: 2007 Certified Organization), Vol. 4, Issue 7, July 2016, Pp13712-13721	2016		Peer Reviewed, Impact factor 5.677, Indexed
15	A Comparative Study of the Soft Computing Models used for Patient Monitoring Systems	International Journal of Engineering Trends and Technology (IJETT) – Volume 37 Number 5 - July 2016http://www.ijettjournal.org, Page 265	2016		IJETT Journal Impact Factor = 1.656 Peer Reviewed

16	Survey On Wireless Body Area Network For Healthcare Applications	International Journal Of Researches In Biosciences, Agriculture And Technology, © Vishwashanti Multipurpose Society (Global Peace Multipurpose Society) R. No.Mh-659/13(N), Www.Vmsindia.Org , Pp 14-17	2017	Peer Reviewed, Impact factor 5.06
17	An experiment with Intelligent Scissors interactive segmentation technique on specific images pp60	International Journal of Scientific and Research Publications, Volume 6, Issue 7, July 2016	2016	Peer Reviewed, Impact factor 5.06
18	An Experiment with GrabCut Interactive Segmentation Technique on Specific Images pp 345	International Journal of Scientific & Engineering Research, Volume 8, Issue 1, January-2017, Journal Listed UGC	2017	Peer Reviewed Impact factor 3.8, Inexed
19	Resolving the Optimization Problems Of Multi Communication Gateway for Remote Embedded Web Server using PSO PP 25-29	IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661,p-ISSN: 2278-8727 www.iosrjournals.org National Conference on Recent Trends in Computer Science and Information Technology 25   Page (NCRTCSIT-2016) Journal Listed UGC 5019	2016	Peer Reviewed
20	Study Of Intrusion Detection System By Particle Swam Optimization	BIONANO FRONTIER NCMAM- 2017,www.bionanofrontier.org Journal Listed UGC sr.No.5104	2017	Sr.No.5104 and NAAS rating 4.19 IF4.856
21	Advance Transportation Technology in Vehicular Ad-hoc Network pp245- 247	International Journal of Advance Engineering and Research Development , Journal Listed UGC44839	2017	Scientific Journal of <b>Impact Factor</b> ( <b>SJIF</b> ): 4.72
22	Promoting Transportation Information System	International Journal of Advance Engineering and Research Development, Journal Listed UGC44839	2017	Scientific Journal of Impact Factor (SJIF): 4.72
23	A Non- Invasive Blood Pressure Measurement	International Journal of Scientific Research in Science and Technology	2017	International Peer Reviewed,

		Using Embedded Technology[(4)1: 137-141 ]	IJSRST4132   NCRDAMDS UGC listed 64011				Impact Factor 5.327
24		An Experiment with Kernel Graph Cut and GMM Based Hidden Markov Random Field Image, Segmentation Techniques	International Journal for Research in Applied Science & Engineering Technology (IJRASET ) Available at www.ijraset.com, UGC listed 44382, 3273-3281	2018			Impact Factor 6.887
25		An Experiment with One Cut and Active Contour Segmentation Techniques	International Journal for Research in Applied Science & Engineering Technology (IJRASET)	2018			Impact Factor: 6.887(UGC Approved Journal
26		Study Of Adaptive Filters For Biomedical Applications	InternationalJournalofCreativeResearchThoughts(IJCRT)www.ijcrt.org321	2018			Impact Factor: 5.97, ISSN: 2320-2882
2.1	Dr. Ashish K. Rewatkar	Smart Wireless Data logger Precise and Low Cost Thermoluminescence Instrumentation Using Embedded Techniques	IJERGS Journal, Vol3, and 2015 Edition (183-188). ISSN 2091-2730	2015		International Journal	3.843
2		RS485 Data Transmitter through GSM Service to Server Database Logger	Resent Trends in Computer Science Information Technology (NCRTCSIT 2016)	7th April 2016	the National Conferenc e		
3		RS485 Data Transmitter through GSM Service to Server Database Logger	IOSR Journal of Computer Engineering (IOSR-JCE), Vol3 e-ISSN: 2278-0661, p- ISSN: 2278-8727 (PP 22-27)	2016		International Journal	
4		Wireless GPRS based Patient Monitoring System with Logging on Database Server on Biomedical Instrumentation	Kamla Nehru Mahavidyalaya, Nagpur held on date. ISBN: 978-93-81432-56-3 (PP 46 – 52)	4th Feb. 2017	National Conferenc e		

i) R&D projects received from different funding agencies indicating title, cost, duration, date of sanction, and name of funding agencies.

Sr. No.	Name of Faculty	Title of Project	Cost and Duration of Project	Date of Sanction and Name of funding agency
1	Dr. Pradeep B. Dahikar	Embedded Digital weighing scale system for Purity and Cast Standardization	Rs. 10,65,300/- 3years from 2012-15	18/07/2012 UGC

# Annexure- III KAMLA NEHRU MAHAVIDYALAYA NAGPUR

Details about in service training for teachers of participating departments:

S. N.	Name of faculty	Department	a) Orientation Course (ASC/ Identified Dept/ College)	b) Refresher Course	Conferences/ Symposia/Seminar/ Workshop
1	Dr. Sandhya Moghe	Biotechnology			6
2	Dr. Sarita Tiwari	Biotechnology			6
3	Dr. Ashwini Darokar	Biotechnology			6
4	Dr. Divya Khumbalkar	Biotechnology			1
5	Mr. Nishant Burade	Biotechnology			1
6	Mr. Vijay Harode	Biotechnology			1
7	Ku. Surbhi Anilrao Shinde	Biotechnology			1
8	Ku. Ashwini Arun Mankar	Biotechnology			1
9	Dr. Anita Chandak	Microbiology			12
10	Dr. Kshama Murarkar	Microbiology			8
11	Dr. Sangeeta D Bhoyar	Microbiology			6
12	Ms.Sonali R.Kumarwar	Microbiology			7
13	Ms.Neha A.M.Sheikh	Microbiology			5
14	Ms. Ashwini V.Kasulkar	Microbiology			4
15	Ms. Aarti R. Dabhekar	Microbiology			3
16	Ms. Minal A. Deolekar	Microbiology			3
17	Dr.Sunita M. Gadegone	Chemistry			23
18	Dr. Wasudeo Gurnule	Chemistry			28
19	Dr. Mamta S.Wagh	Chemistry	2 (6 days)	1 (21 days)	22
20	Dr. Rashmi Dubey	Chemistry			10
21	Ku . Snehal Ashok Pachare	Chemistry			4
22	Ku. Ankita U. Dhande	Chemistry			3
23	Ku. Uma S. Purohit	Chemistry			3
24	Ku. Lata N. Pardhi	Chemistry			2
25	Ms. S N Nagre	Chemistry			1
26	Ms. S G Burade	Chemistry			1
27	Prof. Mrs.V.R.Kharabe	Physics			11
28	Dr.S. A. Bhagat	Physics			11
29	Dr. S. P. Puppalwar	Physics			12
30	Dr. D. S. Badwaik	Physics			13
31	Dr. A. P. Mahajan	Physics	0	1(21 days)	3

32	Mr. Shrikant Suryavanshi	Physics			1
33	Ku. Pooja Zingare	Physics			0
34	Ku. Bhagyashri Bangalkar	Physics			0
35	Dr. Pradeep B. Dahikar	Electronics			14
36	Prof. Pravin M. Sontakke	Electronics	1(21 days)	1(21days)	2
37	Dr. Ashish K. Rewatkar	Electronics			2
38	Prof. Pratiksha S. Kuhikar	Electronics			2
39	Prof. Devidas B. Sonkusare	Electronics			2
40	Prof. Pratibha Sakhare	Electronics			2
41	Mrs. Pratiksha Kuhikar	Electronics			2
42	Ku. Pratibha B. Sakhare	Electronics			2

## **Annexure-IV**

## **Student Details last five years**

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Depa	rtment		Biotechnolog	у						
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(vii)	(vii)	(vii)	(viii)
Sl. No.	Year	No. of seats	Mode of selection	No. of students admitted	No. of students passed out	Category General	Category SC	Category ST	Category OBC	Sex M/F
1	2018- 19	135	Merit Basis, online process	153		33	23	2	95	31/122
2	2017- 18	135	Spot admission	164	136	35	22	3	104	35/129
3	2016- 17	135	Spot admission	154	26	34	23	2	95	36/118
4	2015- 16	135	Spot admission	126	22	28	17	1	80	22/104
5	2014- 15	135	Spot admission	186	22	39	25	4	118	65/121

Department		Microbiology								
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(vii)	(vii)	(vii)	(viii)
Sl. No.	Year	No. of seats	Mode of selection	No. of students admitted	No. of students passed out	Category General	Category SC	Category ST	Category OBC	Sex M/F
1	2018- 19	120	Merit Basis, online process	122		21	20	3	78	21/111
2	2017- 18	120	Spot admission	150	61	24	16	3	107	25/125
3	2016- 17	120	Spot admission	138	56	27	22	5	84	21/117
4	2015- 16	120	Spot admission	170	108	21	27	10	112	20/150
5	2014- 15	120	Spot admission	140	86	34	17	7	82	22/118

Depa	artment		Chemistry							
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(vii)	(vii)	(vii)	(viii)
Sl. No.	Year	No. of seats	Mode of selection	No. of students admitted	No. of students passed out	Category General	Category SC	Category ST	Category OBC	Sex M/F
1	2018- 19	330	Merit Basis, online process	389		71	36	10	272	97/284
2	2017- 18	330	Spot admission	382	161	78	46	11	247	97/285
3	2016- 17	330	Spot admission	402	154	91	46	13	252	106/296
4	2015- 16	330	Spot admission	377	82	69	41	14	253	94/283
5	2014- 15	330	Spot admission	399	70	88	49	11	251	104/295

Depa	rtment		Physics							
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(vii)	(vii)	(vii)	(viii)
Sl. No.	Year	No. of seats	Mode of selection	No. of students admitted	No. of students passed out	Category General	Category SC	Category ST	Category OBC	Sex M/F
1	2018- 19	119	Merit Basis, online process	119		24	14	3	78	54/65
2	2017- 18	103	Merit Basis, online process	113	51	21	16	3	73	49/64
3	2016- 17	132	Spot admission	124	65	17	19	5	83	37/87
4	2015- 16	105	Spot admission	105	45	13	9	4	79	38/67
5	2014- 15	125	Spot admission	127	55	24	12	7	84	56/71

Depa	rtment	Electronics								
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(vii)	(vii)	(vii)	(viii)
Sl. No.	Year	No. of seats	Mode of selection	No. of students admitted	No. of students passed out	Category General	Category SC	Category ST	Category OBC	Sex M/F
1	2018- 19	40	Merit Basis, online process	36		11	8	3	14	16/20
2	2017- 18	40	Merit Basis, online process	47	20	8	12	5	22	20/27
3	2016- 17	40	Spot admission	42	13	13	8	1	20	16/26
4	2015- 16	40	Spot admission	49	10	14	12	4	19	19/30
5	2014- 15	40	Spot admission	47	18	13	9	3	22	20/27

# **ANNEXURE -IV (A)**

# Kamla Nehru Mahvidyalaya, Nagpur

# List of Student Project

# **Department of Biotechnology**

Sr.	Project Title	Class	Name of Student	Academic
No.				Year
1.	Estimation of Protein and Sugar	B. Sc.	Sourabh Thawale	2017-18
	content in chickpea flower	Sem	Vaishnavi Mahajan	
		IV	Kapur	
2.	Analysis of 'DSCDPk7' gene in Rice:	B. Sc.	Chetana Akhand	2017-18
	An insider study	Sem I	Asmita Phopale	
3.	Isolation of microbial colonies from	B. Sc.	Sayali Tijare	2018-19
	root of spinach	Sem I	Trupti Motghare	
			Jagruti Bhawade	
4.	Bacteriological characteristics of	B. Sc.	Vedika Dhamanka	2018-19
	staphylococcus auceus	Sem I	Komal Jagtap	
			Sarang Juare	
			Tanvi Mohod	
5.	Isolation of microbes from pasteurized	B. Sc.	Mohini, Arpita,	2018-19
	and non-pasteurized milk	Sem I	Prachi, Komal,	
			Ankita, Snehal,	
			Tanaya	
6.	Physicochemical analysis of drainage	B. Sc.	Ankita Yadaw	2018-19
	water sample	Sem I	Madhan Shivanla	
			Aancal Karluke	
7.	To determine the pressure of protein in	B. Sc.	Akshita Gupta	2018-19
	pathological sample	Sem I	Sakshi Irarkar	
			Ashelsha	

## KAMLA NEHRU MAHAVIDYALAYA NAGPUR

Sr	Project Title	Class	Name of Student	Academic
No.		Clubb		Year
1.	Comparison of cleansing action	B. Sc. Sem	Pragati R.Moharkar	2018-19
	of shampoo available in the	VI	Krutika P.Dhore	
	market.			
2.	Analysis of fruit juices.	B. Sc. Sem	Saurabh S.Thawkar	2018-19
		VI	Dhanashree S. Rajderkar	
3.	Determination of quantity of	B. Sc. Sem	Tejas K. Zilpe	2018-19
	casein in milk of different	VI	Prachi K. Deoghare	
	brands.			

# **Department Of Chemistry**

## KAMLA NEHRU MAHAVIDYALAYA NAGPUR

# **Department Of Physics**

Sr. No.	Title	Class	Name	Year
1.	Power Supply	B.Sc. Sem. VI	Abhishek G. Ladse	2017-2018
2.			Amar A. Wasake	
3.			Mohit H. Chandra Singh	
4.			Krishna F. Vaidya	
5.	Power Supply	B.Sc. Sem. VI	Nilesh B. Chaudhary	2017-2018
6.			Nilesh S. Khedikar	
7.			Rajat A. Chavan	
8.			Abhishek A. Sangitray	
9.	Power Supply	B.Sc. Sem. VI	Rajat D. Ukey	2017-2018
10.			Rakesh V. Ninawe	
11.			Dipak D. Madawi	
12.	Removed Controll Floor	B.Sc. Sem. VI	Prashant K. Sakharkar	2017-2018
13.	Cleaner		Sachin P. Kumbharkar	
14.			Ujjwal V. Shirpurkar	
15.	Power Supply	B.Sc. Sem. VI	Ashish D. Sathawne	2017-2018
16.			Pranay S. Nimbarte	
17.			Rohan D. Khante	
18.	Power Supply	B.Sc. Sem. VI	Sagar G. Phendar	2017-2018
19.			Sarang P. Mulkar	
20.			Shubham H. Lichade	
21.	Power Supply	B.Sc. Sem. VI	Archana S. Singh	2017-2018
22.			Ashwini K. Kolhe	
23.			Chrushikha Gwalbanshi	
24.	Regulated power supply	B.Sc. Sem. VI	Dipali D. Badge	2017-2018
25.			Gauri V. Giri	
26.			Kalyani B. Dhote	
27.	Power Supply	B.Sc. Sem. VI	Karishma D. Menghare	2017-2018
28.			Krutika V. Sambhare	
29.			Leena M. Gaidhane	
30.	Regulated Power Supply	B.Sc. Sem. VI	Mansi S. Charde	2017-2018
31.			Mayuri K. Vaidya	
32.			Neshme U. Bondre	
33.	Dual Power Supply	B.Sc. Sem. VI	Nikita K. Raut	2017-2018
34.	-		Nisha S. Gosawi	
35.			Pooja A. Kamble	
36.	Dual Power Supply	B.Sc. Sem. VI	Pratiksha S. Atilkar	2017-2018
37.			Rashidha Sheikh	
38.			Samruddhi D. Shenmare	
39.	Zener Regulated Power	B.Sc. Sem. VI	Sanjana S. Dhotkar	2017-2018
40.	Supply		Saylı S. Admane	
41.			Shrilekha N. Bawankar	0015 0010
42.	Power Supply	B.Sc. Sem. VI	Shruti G. Bhoyar	2017-2018
43.	4		Prachi D. Warbhe	
44.			Prachi K,. Balpande	2017 2010
45.	Power Supply	B.Sc. Sem. VI	Keshma I. Sheikh	2017-2018
40.			Smoani B. Fulewale	
4/.	D		Suchita B. Dange	2017 2010
48.	rower Supply	B.SC. Sem. VI	Anjan G. Snembharkar	2017-2018

49.			Anju S. Jadhaw	
50.			Anushri M. Dudhane	
51.	Regulated Power Supply	B.Sc. Sem. VI	Apeksha s. Mathulkar	2017-2018
52.			Bhagyashri R. Bawankar	
53.			Deepali nL. Mangrurkar	
54.	Dual Power Supply	B.Sc. Sem. VI	Chetna R. Waghmare	2017-2018
55.			Bhawana S. Asatkar	
56.			Deepali N. Suryavanshi	
57.	Power Supply	B.Sc. Sem. VI	Gayatri K. Patle	2017-2018
58.			Harshada H. Patre	
59.			Kanchan H. Zade	
60.	Power Supply	B.Sc. Sem. VI	Mohini S. Thakre	2017-2018
61.			Pratiksha K. Zure	
62.			Sandhya S. Tikkas	
63.			Vaidehi A. Potwar	
64.	Dual Power Supply	B.Sc. Sem. VI	Prajkta V. Chate	2017-2018
65.			Pranali R. Padole	
66.			Pranjali R. Dudhe	
67.			Vedika S. Dani	
68.	Vaccum Cleaner	B.Sc. Sem I	Akshay Gupta	2018-2019
69.			Subodh Awarkar	
70.	Water Level Indicator	B.Sc. Sem I	Manish Dhole	2018-2019
71.			Monali Lanjewar	
72.			Vaishnavi VAidya	
73.			Bhagyashri Rehpade	
74.			Mohini KAhalkar	
75.	Vaccum Cleaner on Free	B.Sc. Sem I	Aditi Nimje	2018-2019
76.	energy		Dyaneshwari Kurvey	
77.			Nidhi Gupta	
78.			Siddhi Sharme	
79.	Walking Robot	B.Sc. Sem I	Sandesh Zade	2018-2019
80.			Sahil Nagpure	
81.			Nilesh Khawas	
82.			Priti Gawande	
83.			Pratik Tiwari	
84.	Projector	B.Sc. Sem I	Prajakta Dakre	2018-2019
85.			Ruchi Thakre	
86.	Lift	B.Sc. Sem I	Supriya Dohare	2018-2019
87.			Shaurya Zunzunwale	
88.			Muskan Sheikh	
89.	Einstein Gravity	M.Sc. Sem I	Rohan Khante	2018-2019
90.			Akshay Dhote	

## KAMLA NEHRU MAHAVIDYALAYA NAGPUR

# **Department Of Electronics**

Sr.	Title Of Project	Name Of Student	Class	Year
No.	Pridge Ways Postifier	Svoli Surash Ingola	PSo IVoor	2018 10
1		Syan Sulesh Ingale		2010-19
2	Use of Solar Cell energy for home appliences	Navin Kailash Uikey	B.Sc. I Year	2018-19
3	Automatic Street Light Control System	Chaitalee Moreshwarrao Thakare	B.Sc. I Year	2018-19
4	Light Detector Using Nano Gate	Priti Sunil Agarkar	B.Sc. I Year	2018-19
5	Portable Mobile Charger	Nitesh Jitendra Samrit	B.Sc. I Year	2018-19
6	Tension Indicator	Chanchal Dattuji Devikar	B.Sc. I Year	2018-19
7	Door Bell	Simran Ramkrushana Bokade	B.Sc. I Year	2018-19
8	Smoke Absorber Machine	Pralhad Amdas Dhoble	B.Sc. I Year	2018-19
9	Study Of Basic Logic Gates	Nikhil Tukaram Kamble	B.Sc. I Year	2018-19
10	Study Of All Rectifiers	Dimple Narendra Thakre	B.Sc. I Year	2018-19
11	Study Of All Rectifiers	Sahil Sunil Shinde	B.Sc. I Year	2018-19
12	Automatic Night Light Using Ldr	Samiksha Nandkishor Kalode	B.Sc. I Year	2018-19
13	Wireless Ac Power Detector	Kamna Ajay Dorlikar	B.Sc. I Year	2018-19
14	Water Alarm	Prajwal Umesh Wanjari	B.Sc. I Year	2018-19
15	Smoke Absorber Machine	Yash Prakash Maske	B.Sc. I Year	2018-19
16	Automatic Streetlight Control System	Khushbu Rajkumar Lanjewar	B.Sc. I Year	2018-19
17	Burglar Alarm	Pranay Shiriram Lute	B.Sc. I Year	2018-19
18	Led Light Flashing By Microphone	Krutika Ramu Thakre	B.Sc. I Year	2018-19
19	Conversion Of Adc	Smita Sanjay Suple	B.Sc. I Year	2018-19
20	Rain Water Alarm	Tushar Babarao Bhoyar	B.Sc. I Year	2018-19
21	Water Level Indicator	Isha Naresh Gupta	B.Sc. I Year	2018-19
22	Bridge Wave Rectifier	Vaishnavi Dinesh Sarsewar	B.Sc. I Year	2018-19
23	Rain Detector	Ajay Tapan Poddar	B.Sc. I Year	2018-19
24	Power Supply	Ruchika Anil Khedekar	B.Sc. I Year	2018-19
25	Study Of Flip Flop Using Logic Gates	Ritik Deepak Bagmar	B.Sc. I Year	2018-19
26	Study Of Universal Gates	Harshal Liladhar Sonkusare	B.Sc. I Year	2018-19
27	Metal Detector	Mayuresh Sudhakar Pantawane	B.Sc. I Year	2018-19

28	Fire Alarm	Pratiksha Rajesh Ugale	B.Sc. I Year	2018-19
29	Power Supply	Saujanya Gautam Gedam	B.Sc. I Year	2018-19
30	Study Of Rectifier Circuit	Roshan Moreshwar Ujwalkar	B.Sc. I Year	2018-19
31	Study Of Adc &Dac	Nayan Arvind Chandekar	B.Sc. I Year	2018-19
32	Rain Water Alarm	Shivavi Purushottam Bhanuse	B.Sc. I Year	2018-19
33	Water Level Indicator	Priti Yogeshwar Patil	B.Sc. I Year	2018-19
34	Study Of Ac Power Supply	Nishika Ravindra Tete	B.Sc. I Year	2018-19
35	Automatic Streetlight Control System	Darshak Raju Paunikar	B.Sc. I Year	2018-19
36	Study Of Filter Circuits	Papiha Raju Ghube	B.Sc. I Year	2018-19
37	Hidden Active Cell Phone Detector	Aishwarya Mahadeo Patle	B.Sc.Ii Year	2018-19
38	Masqito Repellent Circuit	Aniket Dilip Thiske	B.Sc.Ii Year	2018-19
39	Using Ir Led Sensor Automatic Door On/ Off	Aniket Vijay Gaidhane	B.Sc.Ii Year	2018-19
40	Infrared Burglar Alarm	Aniket Vijaykumar Kalbende	B.Sc.Ii Year	2018-19
41	Automatic Railway Gate Controlling And Signalling	Ashwini Chandrashekhar Chikhale	B.Sc.Ii Year	2018-19
42	Infrared Burglar Alarm	Chetan Shridhar Khadse	B.Sc.Ii Year	2018-19
43	Traffic Light Signal Controlling Using 8051	Damini Ramesh Dorlikar	B.Sc.Ii Year	2018-19
44	Infrared Burglar Alarm	Devanshu Satish Rakhunde	B.Sc.Ii Year	2018-19
45	Fm Booster	Dhanshree Namdeorao Chaple	B.Sc.Ii Year	2018-19
46	Automatic Railway Gate Controlling And Signalling	Harsha Dnyaneshwarrao Ramne	B.Sc.Ii Year	2018-19
47	Break Failure Indicator	Karuna Diwakar Nagose	B.Sc.Ii Year	2018-19
48	Noise Meter	Kriti Dinesh Kawale	B.Sc.Ii Year	2018-19
49	Using Ir Led Sensor Automatic Door On/ Off	Kunal Fattu Patre	B.Sc.Ii Year	2018-19
50	Break Failure Indicator	Mitali Subhash Vilayatkar	B.Sc.Ii Year	2018-19
51	Fm Booster	Mrudul Vilas Chichmalkar	B.Sc.Ii Year	2018-19
52	Digital Tachometer	Neha Shudhakar Shivankar	B.Sc.Ii Year	2018-19
53	Traffic Light Signal Controlling Using 8051	Nikhil Raju Bharadbhunje	B.Sc.Ii Year	2018-19
54	Direct Secutity System	Pankaj Daulatrao Raut	B.Sc.Ii Year	2018-19
55	Digital Tachometer	Pooja Manohar Rewaskar	B.Sc.Ii Year	2018-19
56	Noise Meter	Priya Vijayrao Dhomne	B.Sc.Ii Year	2018-19
57	Noise Meter	Priyanka Pravin Rindhe	B.Sc.Ii Year	2018-19
58	Fire Alarm	Rahul Kishor Ramteke	B.Sc.Ii Year	2018-19

59	Fire Alarm	Rohit Manohar Nirwan	B.Sc.Ii Year	2018-19
60	Masqito Repellent Circuit	Shrutika Rajesh Mendhe	B.Sc.Ii Year	2018-19
61	Traffic Light Signal Controlling Using 8051	Shubham Shyamrao Khadsan	B.Sc.Ii Year	2018-19
62	Break Failure Indicator	Shubhank Mahendra Doye	B.Sc.Ii Year	2018-19
63	Infrared Burglar Alarm	Shweta Yashwant Gaikwad	B.Sc.Ii Year	2018-19
64	Fm Booster	Sopan Ram Channe	B.Sc.Ii Year	2018-19
65	Automatic Railway Gate Controlling And Signalling	Vaibhav Ravindra Waghmare	B.Sc.Ii Year	2018-19
66	Break Failure Indicator	Yash Vilas Sonurkar	B.Sc.Ii Year	2018-19
67	Light Emitting Diode	Akash Pradip Lende	B.Sc Final	2018-19
68	Dual Power Supply	Aniket Arun Bokde	B.Sc Final	2018-19
69	5g Mobile Technology	Ankit Mukeshrao Vidhate	B.Sc Final	2018-19
70	Simple Digital Security System	Apurva Devman Raut	B.Sc Final	2018-19
71	Vibrationactivated Alarm	Apurva Dinkar Raut	B.Sc Final	2018-19
72	Solar Mobile Charger	Asavari Shiripad Khond	B.Sc Final	2018-19
73	Intel 8255 Programmable Peripheral Interference	Bhagyashri Umesh Chatap	B.Sc Final	2018-19
74	Automatic Fan Controller	Bhavana Laxmanrao Sorte	B.Sc Final	2018-19
75	Optical Fibre Cable	Diksha Suresh Dharmare	B.Sc Final	2018-19
76	Cellular Network	Isha Sunil Dalal	B.Sc Final	2018-19
77	Water Level Indicator	Neha Vishnuji Raymal	B.Sc Final	2018-19
78	Artificial Intelligence In Electronics	Prajwa Bhagwat Warkhade	B.Sc Final	2018-19
79	Pc Controlled Home Applinces	Pratik Gajanan Gonnade	B.Sc Final	2018-19
80	Automatic Street Light	Riya Shankar Gaikwad	B.Sc Final	2018-19
81	Wireless Solar Mobile Phone Charger	Sagar Rajkumar Titare	B.Sc Final	2018-19
82	Blutooth Techonology	Sampa Suresh Shambharkar	B.Sc Final	2018-19
83	Smoking Alarm	Sanskruti Dipak Mohitkar	B.Sc Final	2018-19
84	Simple Digital Security System	Sapana Rabhakarrao Belsare	B.Sc Final	2018-19
85	5g Mobile Technology	Satyajit Ranjeet Barokar	B.Sc Final	2018-19
86	Vibration Activated Alarm	Snehal Sanjay Kadoo	B.Sc Final	2018-19
87	Wireless Doorbell System	Swapnil Namdeo Paunikar	B.Sc Final	2018-19
88	Cellular Network	Vaibhav Ghanshyam Mendhe	B.Sc Final	2018-19
89	Light Emitted Diode	Vaishnavi Shamrao Khandait	B.Sc Final	2018-19

90	Variable Power Supply	Vishad Waman Hatwar	B.Sc Final	2018-19
91	Water Level Indicator	Vrushabh Namdeorao Tale	B.Sc Final	2018-19
92	Blutooth Techonology	Yogini Pradeep Mohod	B.Sc Final	2018-19

#### BIOTECHNOLOGY B. Sc. Semester Pattern Syllabus B. Sc. Part I – Semester I BIOTECHNOLOGY (With effect from academic session 2013-14)

1) The examination shall comprise two theory papers, an Internal assessment and a practical. Each theory paper shall be of three hours duration and carry 50 marks. The practical shall be of 6 hours duration and carry 30 marks. Internal assessment carry 20 marks.

	Theory Paper I Theory Paper II Practical Internal Assessment	50 marks 50 marks 30 marks 20 marks
		Total - 150 marks
2)	The distribution of marks in practical shall be as follows.	
	[A] Experiments,	20 marks
	[B] Practical record	05 marks
	[C] Viva	05 marks
		Total - 30 marks

- 3) The syllabus is based on six theory periods and six practical periods per week. Candidates are required to pass separately in theory, internal assessment and practical examination.
- 4) Students are expected to perform all the practicals mentioned in the syllabus.
- 5) Internal assessment: There shall be one internal assessment based on two theory papers for 10 Marks each. Total 20 Marks. The Internal assessment shall be conducted by the University approved teachers in the relevant subjects. The internal assessment shall be done by the respective college one month prior to the final exam of each semester. The Marks shall be sent to the university immediately after the internal assessment is over.
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- 7) The internal assessment marks assigned to each theory paper shall be awarded on the basis of attendance / home assignment / class test / Project assignment / seminar / any other innovative practice / activity.
- 8) The concerned teacher / department / college shall have to keep the record of all the above activities till six months after the declaration of result of that semester.

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### UNIT I

#### History, Development and Microscopy

History and development of microbiology: contributions of Louis Pasteur, Robert Koch and Edward Jenner. Microscopy: Compound microscopy: Numerical aperture and its importance, resolving power, oil immersion objectives and their significance, principles and applications of dark field, phase contrast, fluorescent microscopy. Electron microscopy: Principle, ray diagram and applications, TEM and SEM, comparison between optical and electron microscope, limitations of electron microscopy. Stains and staining procedures: Acidic, basic and neutral stains, Gram staining, Acid fast staining, Flagella staining, Endospore staining.

### UNIT II

#### **Bacteria:**

Bacterial morphology and subcellular structures, general morphology of bacteria, shapes and sizes, generalized diagram of typical bacterial cell.

Slime layer and capsule, difference between the structure, function and the position of the two structures. Cell wall of gram +ve and Gram -ve cells.

General account of flagella and fimbriae.

Chromatin material, plasmids; definition and kind of plasmids (conjugative and non-conjugative) F, R, and Col plasmids.

Endospores: Detailed study of endospore structure and its formation, germination, basis of resistance.

#### UNIT III

- A. A brief idea Bergey's manual. Morphology of archaea, archaeal cell membrane (differences between bacterial and archaeal cell membrane), other cell structures, concept of the three distinct archaea groups.
- B. **Viruses**: General characteristics of viruses, difference between virus and typical microbial cell, structure, different shapes and symmetries with one example of each type, classification of viruses on the basis of nucleic acids, phage and animal cell viruses, example of each and their importance. Brief idea of lytic cycle and lysogeny.

#### UNIT IV

Nutrition: Basic nutritional requirements: Basic idea of such nutrients as water, carbon, nitrogen, sulfur and vitamins etc., natural and synthetic media, nutritional classification of bacteria. Selective and Differential media, Enriched media, Enrichment media.

UNIT I Nucleic Acids

B. Sc. Part I – Semester I - PAPER II (MACROMOLEULES)

Chemical structure and base composition of nucleic acids, Chargaff's rules, Watson Crick Model (B-DNA), deviations from Watson-Crick model, other forms of DNA (A- and Z-DNA), forces stabilizing nucleic acid structures, (hydrogen bonds and hydrophobic associations, base stacking). Maxam and Gilbert DNA sequencing, structure of t-RNA.

#### UNIT II

#### Chromosomes, Concept of Genes and Nucleosomes

Concept of prokaryotic genes and eukaryotic genes: Definition of a gene, concept of split genes, introns, exons, spacers, C-value and C-value paradox, basic idea of Cot curves.

Chromatin structure: Nucleosome structure (10 nm fibre, experiments leading to discovery of nucleosomal structure, types of histones, arrangement of histones in the octamer, H1 histone and its

role, role and length of linker DNA), 30 nm fibers (arrangement of nucleosome in a helical structure), domain and loop structure (further compacting of 30 nm fibre, role of scaffolding proteins). Role of telomere and centromere, telomeric and centromeric repeat sequences.

#### UNIT III

Amino acids: Structure of amino acids occurring in proteins, classification of amino acids (pH based, polarity based and nutrition based), Physico-chemical properties of amino acids (solubility, boiling and melting points, reactions like Edman's, Sanger's, Dansyl chloride, ninhydrin). Titration curves of neutral, basic and acidic amino acids.

Primary structure of proteins: Determination of primary structure (end group analysis, cleavage of disulfide bonds, amino acid composition, use of endopeptidase specificity, sequence determination, assignment of disulfide position).

#### UNIT IV

Secondary structure of proteins: The  $\Box$ -helix,  $\Box$ -structures (parallel, antiparallel, mixed,  $\Box$ -turn). Tertiary structure of proteins: Forces that stabilize the structure (electrostatic forces, hydrogen and disulfide bonds, hydrophobic associations), myoglobin as an example of tertiary structure, concept of domains, protein denaturation.

Quaternary structure of proteins: Forces stabilizing quaternary structure, advantages of oligomeric proteins.

#### B.Sc. I SEMESTER I PRACTICALS Biotechnology Microbiology & Macromolecules

- 1. Formol titration of glycine.
- 2. Quantitative Estimation of proteins by Biuret method
- 3. Determination of albumin & A/G retion in serum.
- 4. Estimation of DNA by Diphenylamine method
- 5. Estimation of RNA by Orcinol method
- 6. Quantitative estimation of amino acids using Ninhydrin reaction.
- 7. Demonstration, use and care of microbiological equipments.
- 8. Preparation of media, sterilization and isolation of bacteria.
- 9. Isolation of Bacteriophage from sewage / other sources.
- 10. Demonstration of motility of Bacteria.
- 11. Simple staining of bacteria
- 12. Gram staining of Bacteria
- 13. Acid fast staining of Bacteria
- 14. Endospore staining.
- 15. Demonstration of starch hydrolysis by bacterial cultures
- 16. Growth of fecal coliforms on selective media.

Note: - Mandatory to perform atleast 6 practical

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#### **BIOTECHNOLOGY B. Sc. Semester Pattern Syllabus**

#### B. Sc. Part I – Semester II BIOTECHNOLOGY (With effect from academic session 2013-14)

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		Total - 150 marks
2)	The distribution of marks in practical shall be as follows.	
	[A] Experiments,	20 marks
	[B] Practical record	05 marks
	[C] Viva	05 marks
		Total - 30 marks

3) The syllabus is based on six theory periods and six practical periods per week. Candidates are required to pass separately in theory, internal assessment and practical examination.

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#### B. Sc. Part I – Semester II -PAPER I MICROBIOLOGY & CELL BIOLOGY

#### UNIT I

#### **Microbial Growth**

Growth: Growth rate and generation time, details of growth curve and its various phases. Concept of synchronous cultures, continuous and batch cultures (chemostat and turbidostat). Measurement of growth.

Physical conditions required for growth: Temperature (classification of microorganisms on the basis of temperature requirements), Ph etc. Pure cultures and cultural characteristics. Maintenance of pure culture.

#### UNIT II: B. Microbial Control

Microbial Control: Terminologies - Sterilization, disinfection, antiseptic, sanitization, germicide, microbistasis, preservative and antimicrobial agents.

Mechanism of cell injury: Damage to cell wall, cell membrane, denaturation of proteins, inhibition of protein synthesis, transcription, replication, other metabolic reactions and change in supercoiling of DNA.

Physical control: Temperature (moist heat, autoclave, dry heat, hot air oven and incinerators), dessication, surface tension, osmotic pressure, radiation, UV light, electricity, ultrasonic sound waves, filtration.

Chemical control: Antiseptics and disinfectants (halogens, alcohol, gaseous sterilization. Concept of biological control.

#### UNIT III Cell Biology

Eukaryotic Cell - Structure and function of the following: nucleus, nuclear membrane, nucleoplasm, nucleolus, golgi complex, endoplasmic reticulum, lysosomes, peroxisomes, glyoxisomes and vacuoles.

## UNIT IV

Plant cell wall. Cytoskeleton (actin, microtubules) and cell locomotion. Mitosis and meiosis. Brief idea of cell cycle. Muscle and nerve cell structure, synaptic transmission and neuromuscular junctions.

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- B. UNIT I
- C. Carbohydrates
- D.

E. Sc. Part I – Semester II - PAPER II (CELL CONSTITUENTS & ENZYMOLOGY)

Definition, classification, nomenclature of carbohydrates, structures of monosaccharides, disaccharides and polysaccharides (structures of starch and glycogen as examples of homopolysaccharides). Concept and examples of heteropolysaccharides.

### UNIT II

Lipids

Types of lipids, structures of saturated and unsaturated fatty acids, triglycerides, phospholipids, plasmalogens, gangliosides and sphingolipids. Terpenoids and isoprenoids - definition and representative structures, steroids. Concept of acid value, saponification value and iodine value.

### UNIT III

Enzymes

Terminology: Active site, allosteric site, Holoenzyme, apoenzyme, coenzyme, substrate, inhibitor, activator, modulator etc.

Classification and nomenclature.

Concept of isoenzymes (example Lactate Dehydrogenase) and multienzymes (example pyruvate dehydrogenase) Substrate Specificity (bond specificity, group specificity, absolute specificity, stereo-specificity, proof-reading mechanism), lock and key and induced fit models.

Concept of allosteric enzymes (brief idea of ATCase as an

example) Mechanisms of catalysis: Acid-base, covalent and metal ion catalysis.

#### UNIT IV

Assay of Enzymes: Concept of activity, specific activity, turnover number, units of enzyme activity (katal, international unit), spectrophotometric methods of assay of enzymes (simple and coupled assay), very brief idea of other methods.

Enzyme kinetics: Michaelis-Menten equation, effect of substrate concentration, effect of enzyme concentration, effect of Ph and temperature, temperature quotient, single reciprocal (Eadie-Hoffstee equation) and double reciprocal plots (Lineweaver-Burke plots), enzyme inhibition kinetics (reversible inhibition types – competitive, uncompetitive and non-competitive), brief idea of irreversible inhibition.

I II

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#### B.Sc. SEMESTER PRACTICALS

Biotechnology Microbiology, Cell constituents & Enzymology

- 1. Qualitative Analysis of sugars and proteins.
- 2. Quantitative estimation of sugars (Dinitrosalicylic acid method).
- 3. Estimation of glucose by Benedict's quantitative method
- 4. Quantitative estimation of proteins by Lowry's method.
- 5. Extraction and quantification of total lipids.
- 6. Determination of saponification value of Fats
- 7. Determination of Acid Value of Fats
- 8. Isolation of urease and demonstration of its activity
- 9. Assay of protease activity.
- 10. Preparation of starch from Potato and its hydrolysis by salivary amylase.
- 11. Assay of alkaline phosphatase
- 12. Immobilization of enzymes / cells by entrapment in alginate gel
- 13. Effect of temperature / pH on enzyme activity
- 14. Isolation of pure culture by pour plate method
- 15. Isolation of pure culture by streak plate method.
- 16. Anaerobic cultivation of microorganisms.
- 17. Cultivation of yeast and moulds.
- 18. Antibiotic sensitivity assay.
- 19. Oligodynamic action of metals.
- 20. To study germicidal effect of UV light on bacterial growth.
- 21. Stages of mitosis.
- 22. Stages of meiosis.

#### Note: - Mandatory to perform atleast 6 practical.

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#### B. Sc. Semester Pattern Syllabus B. Sc. Part II – Semester III BIOTECHNOLOGY (With effect from academic session 2014-15)

1) The examination shall comprise two theory papers, an Internal assessment and a practical. Each theory paper shall be of three hours duration and carry 50 marks. The practical shall be of 6 hours duration and carry 30 marks. Internal assessment carry 20 marks.

	Theory Paper I Theory Paper II Practical Internal Assessment	50 marks 50 marks 30 marks 20 marks
		Total - 150 marks
2)	The distribution of marks in practical shall be as follows.	
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	[C] Viva	05 marks
		Total - 30 marks

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- 5) Internal assessment: There shall be one internal assessment based on two theory papers for 10 Marks each. Total 20 Marks. The Internal assessment shall be conducted by the University approved teachers in the relevant subjects. The internal assessment shall be done by the respective college one month prior to the final exam of each semester. The Marks shall be sent to the university immediately after the internal assessment is over.
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## UNIT IB. Sc. Part II – Semester III - PAPER - I (METABOLISM)

**Bioenergetics**: Concept of free energy, Entropy, Enthalpy & Redox Potential. Concept of high energy bonds as related to the structure of ATP, Phosphoenolpyruvate, Creatine phosphate etc. Glycolysis (pathway, entry of other monosachharides and disaccharides, regulation, inhibitors) Gluconeogenesis: Bypass reactions.

## UNIT II

Structure of mitochondria.

TCA cycle: Detailed account, regulation, amphibolic nature and anaplerosis.

Electron Transport Chain: Components of the chain, sites of ATP synthesis, chemiosmotic theory of oxidative phosphorylation.

## UNIT III Lipid Metabolism

□-oxidation of fatty acids, role of carnitine, oxidation of unsaturated fatty acids & odd carbon fatty acids. Regulation.

Ketogenesis, Ketosis & ketoacidosis in physiology & pathology.

Biosynthesis of fatty acids, fatty acid synthase complex, regulation, Microsomal & Mitochondrial system of chain elongation & synthesis of unsaturated fatty acids.

## UNIT IV

## **Metabolism of Nitrogenous Compounds**

Transamination (mechanism). Oxidative & Non-oxidative deamination.

Urea cycle: Detailed account, linkage of urea & TCA cycle, compartmentation of urea cycle, regulation, metabolic disorders of urea cycle.

Transmethylation & Decarboxylation, physiologically important products of

decarboxylation. Biosynthesis of purines and pyrimidines: Salvage pathways.

## UNIT – I:

# B. Sc. Part II – Semester III - PAPER – II (BIOPHYSICAL

**TECHNIQUES I)** 

Spectrophotometry: Concept of electromagnetic radiation, spectrum of light, absorption of electromagnetic radiations, Concept of chromophores and auxochromes, involvement of orbitals in absorption of electromagnetic radiations, Absorption spectrum and its uses, Beer's law - derivation and deviations, extinction coefficient. Difference between spectrophotometer and colorimeter. Instrumentation of UV and visible spectrophotometry Double beam spectrometer; dual-wavelength spectrometer

## UNIT II:

- a) Applications of UV and visible spectrophotometry.
- b) Spectrofluorometry: principle, instrumentation and applications. Absorption & emission flame photometry: principle, instrumentation and application.
- c) Principles of IR and Mass spectrometry

## UNIT III:

Chromatography: Partition principle, partition coefficient, nature of partition forces, brief account of paper chromatography.

Thin layer chromatography and column chromatography.

Gel filtration: Concept of distribution coefficient, types of gels and glass beads, applications.

## UNIT IV

Ion-exchange chromatography: Principle, types of resins, choice of buffers, applications including amino acid analyzer.

Affinity chromatography: Principle, selection of ligand, brief idea of ligand attachment, specific and non-specific elution, applications.

Elements of high pressure liquid chromatography.

#### B.Sc. II SEMESTER III PRACTICALS Biotechnology Metabolism & Biophysical Techniques

- 1. Spectrophotometric analysis of DNA denaturation.
- 2. Determination of absorption spectrum of oxy- and deoxyhemoglobin and methemoglobin.
- 3. Protein estimation by E280/E260 method.
- 4. Paper chromatography of amino acids/sugars.
- 5. TLC of sugars/amino acids.
- 6. Cellular fractionation and separation of cell organelles using centrifuge.
- 7. Isolation of mitochondria and assay of marker enzyme.
- 8. Estimation of Urea by diacetyle monoxime method
- 9. Estimation of Sugars by Folin Wu method
- 10. Validity of Beer's law for colorimetric estimation of creatinine.
- 11. Absorption spectrum of NAD & NADH
- 12. Preparation of standard buffers and determination of pH of a solution
- 13. Titration of a mixture of strong & weak acid

## Note: - Mandatory to perform atleast 6 practical

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#### B. Sc. Semester Pattern Syllabus B. Sc. Part II – Semester IV BIOTECHNOLOGY (With effect from academic session 2014-15)

1) The examination shall comprise two theory papers, an Internal assessment and a practical. Each theory paper shall be of three hours duration and carry 50 marks. The practical shall be of 6 hours duration and carry 30 marks. Internal assessment carry 20 marks.

	Theory Paper I Theory Paper II	50 marks 50 marks
	Practical	30 marks
	Internal Assessment	20 marks
		Total - 150 marks
2)	The distribution of marks in practical shall be as follows.	
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#### Total - 30 marks

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#### \_\_\_\_\_

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## UNIT I

## B. Sc. Part II – Semester IV - PAPER - I (IMMUNOLOGY)

Immune system, Organs and cells of immune

system Immunity, innate immune mechanism

Acquired immune mechanism, Antigen, Antigenecity (factors affecting

antigenecity) Humoral immunity, main pathways of complement system.

## UNIT II

Antibody structure and classes.

Cell mediated immunity: TC mediated immunity, NK cell mediated immunity, ADCC, delayed type hypersensitivity, cytokines and brief idea of MHC.

## UNIT III

Hypersensitivity and vaccination : General features of hypersensitivity, various types of

hypersensitivity, Vaccination: Discovery, principles, significance. Concept of autoimmunity. **UNIT IV** 

Immunological Techniques: Antigen-antibody reactions: Precipitation, agglutination, complement fixation, immunodiffusion, ELISA.

Hybridoma technology: Monoclonal antibodies and their applications in immunodiagnosis.

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## UNIT – I:

# B. Sc. Part II – Semester IV - PAPER – II (BIOSTASTICS & BIOPHYSICAL TECHNIQUES II)

- a) Migration of ions in electric field, Factors affecting electrophoretic mobility.
- b) Paper electrophoresis: Electrophoretic run, Detection techniques, Cellulose acetate electrophoresis, High voltage electrophoresis.
- c) Gel electrophoresis: Types of gels, Solubilizers, Procedure, Column & slab gels, Detection, Recovery & Estimation of macromolecules.

## UNIT II

a) SDS-PAGE Electrophoresis: - applications (determination of molecular weight of proteins,

determination of subunit stoichiometry, molecular biology applications).

- b) Isoelectric focussing, Principle, Establishing pH amd density gradients, Procedures & applications.
- c) Pulsed-field gel electrophoresis.

## UNIT – III:

#### Isotopic tracer technique: -

- a) Radioactive & stable isotopes, rate of radioactive decay. Units of radioactivity.
- b) Measurement of radioactivity: Ionization chambers, proportional counters, Geiger- Muller counter, Solid and liquid scintillation counters (basic principle, instrumentation and technique), Cerenkov radiation.
- c) Measurement of Stable isotopes: Falling drop method for deuterium measurement, Mass spectrometry.
- d) Principles of tracer technique, advantages and limitations, applications of isotopes in biotechnology (distribution studies, metabolic studies, isotope dilution technique, metabolic studies, clinical applications, autoradiography).

## UNIT IV

#### **Centrifugation:**

- a) Basic principles, concept of RCF, types of centrifuges (clinical, high speed and ultracentrifuges).
- b) Preparative centrifugation: Differential and density gradient centrifugation, applications (Isolation of cell components).
- c) Analytical centrifugation: Sedimentation coefficient, determination of molecular weight by sedimentation velocity and sedimentation equilibrium methods.

#### **Biostatistics**

Basic concepts of mean, median, mode, Standard deviation and Standard error

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## B.Sc. II

#### SEMESTER IV PRACTICALS Biotechnology Immunology & Biophysical techniques

- 1. Antigen antibody reaction determination of Blood group
- 2. Pregnancy test
- 3. Widal test
- 4. Ouchterloney immunodiffusion
- 5. Radial immunodiffusion
- 6. ELISA
- 7. Isolation of casein by isoelectric precipitation
- 8. Paper electrophoresis of proteins
- 9. Gel electrophoresis of proteins.
- 10. SDS-PAGE of an oligomeric protein.
- 11. Calculation of mean, median, and mode (manual/computer aided).
- 12. Calculation of standard deviation and standard error (manual/computer aided).
- 13. Biostatistical problem based on standard deviation.

## Note: - Mandatory to perform atleast 6 practical

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## B. Sc. Semester Pattern Syllabus B. Sc. Part III – Semester V BIOTECHNOLOGY

#### (With effect from academic session 2015-16)

1) The examination shall comprise two theory papers, an Internal assessment and a practical. Each theory paper shall be of three hours duration and carry 50 marks. The practical shall be of 6 hours duration and carry 30 marks. Internal assessment carry 20 marks.

	Theory Paper I Theory Paper II Practical Internal Assessment	50 marks 50 marks 30 marks 20 marks
		Total - 150 marks
2)	The distribution of marks in practical shall be as follows.	
	[A] Experiments,	20 marks
	[B] Practical record	05 marks
	[C] Viva	05 marks
		Total - 30 marks

3) The syllabus is based on six theory periods and six practical periods per week. Candidates are required to pass separately in theory, internal assessment and practical examination.

- 4) Students are expected to perform all the practicals mentioned in the syllabus.
- 5) Internal assessment: There shall be one internal assessment based on two theory papers for 10 Marks each. Total 20 Marks. The Internal assessment shall be conducted by the University approved teachers in the relevant subjects. The internal assessment shall be done by the respective college one month prior to the final exam of each semester. The Marks shall be sent to the university immediately after the internal assessment is over.
- 6) At the beginning of each semester, every teacher / department / college shall inform his / her students unambiguously the method teacher / department / college propose to adopt a scheme of marking for internal assessment.
- 7) The internal assessment marks assigned to each theory paper shall be awarded on the basis of attendance / home assignment / class test / Project assignment / seminar / any other innovative practice / activity.
- 8) The concerned teacher / department / college shall have to keep the record of all the above activities till six months after the declaration of result of that semester.

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## UNIT I

## DNA ReplicationSc. Part III –Semester V - PAPER – I (MOLECULAR

**BIOLOGY**)Enzymology of replication (detailed treatment of DNA polymerase I, brief treatment of pol II and III, helicases, topoisomerases, single strand binding proteins, DNA melting proteins, primase and RNA primers, distributive and processive properties of DNA polymerase I and III, importance of the  $\Box$ -subunit in polymerase III), proof for semiconservative replication, discontinuous replication and Okazaki fragments, Replication origins, initiation, primosome formation, elongation, and termination. Use of DNA replication mutants in the study of replication.

## UNIT II

## **Mutations & DNA Repair**

Gene mutations: Missense, nonsense and frameshift mutations. Mutagens: Physical and chemical mutagens. Repair: Mismatch repair, NER, BER, light induced repair, SOS repair.

## UNIT III

## Transcription

Enzymatic synthesis of RNA: Basic features of transcription, structure of prokaryotic RNA polymerase (core enzyme and holoenzyme, significance of  $\Box$  factor), concept of promoter (Pribnow box, -10 and -35 sequences and their significance), auxiliary proteins of transcription, role of NusA. Four steps of transcription (promoter binding and activation, RNA chain initiation and promoter escape, chain elongation, termination and release).

## UNIT IV

Details of initiation, elongation, and termination (intrinsic and rho factor mediated termination). Brief idea of reverse transcription.

Regulation of Transcription in Prokaryotes: Basic idea of lac- and trp-operons.

## UNIT I

#### **Genetic Code**

#### B. Sc. Part III – Semester V - PAPER – II (MOLECULAR BIOLOGY & rDNA TECHNOLOGY)

Genetic code: Argument for triplet code, experimental elucidation of codons, identification of start and stop codons, universality, degeneracy and commaless nature of codons.

The decoding system: aminoacyl synthetases, brief structure of tRNA, the adaptor hypothesis, attachment of amino acids to tRNA.

Codon-anticodon interaction - the wobble hypothesis.

Selection of initiation codon - Shine and Dalgarno sequence and the 16S rRNA.

## UNIT II

## **Protein synthesis:**

Initiation, elongation, and termination.

Regulation of translation: Autogenous control of r-proteins, phage T4 protein p32 translational regulation. Antibiotics affecting translation.

## UNIT III

## rDNA Technology

DNA cloning: Basics of genetic engineering, restriction endonucleases, other enzymes of DNA manipulation. Vectors: Plasmid vectors (pBR322 and pUC 18/19)

Phage vector: Lambda replacement and insertion

vectors Cosmids, phagemids, and YAC.

Cutting and joining DNA (cohesive end ligation, methods of blunt end ligation). Transfection and transformation. Selection of transformed cells. Screening methods.

## UNIT IV

Genomic DNA library and cDNA library – concept and methods of creating these libraries. Advantages and disadvantages of cDNA library over genomic DNA library.

General consideration of Polymerase chain reaction, designing of primers for PCR. Expression of cloned genes: General features of an expression vector. Expression of a eukaryotic gene in prokaryotes – advantages and problems. Applications of recombinant DNA technology:

## B.Sc. III SEMESTER V PRACTICALS Biotechnology Molecular Biology & rDNA technology

- 1. To measure concentration of DNA & RNA by UV spectrophotometry
- 2. Estimation of proteins by Bradford method
- 3. Isolation of genomic DNA.
- 4. Isolation of Plasmid DNA.
- 5. Isolation of chloroplast DNA.
- 6. Restriction digestion of DNA.
- 7. Demonstration of Replica plating technique
- 8. Identification of Lac+ bacteria by blue white screening using IPTG
- 9. Ligation of DNA
- 10. Demonstration of Southern blotting
- 11. Demonstration of western blotting
- 12. Chemical mutagenesis and production of microbial mutants.

Note: - Mandatory to perform atleast 6 practical

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#### B. Sc. Semester Pattern Syllabus B. Sc. Part III – Semester VI

## BIOTECHNOLOGY

#### (With effect from academic session 2015-16)

1) The examination shall comprise two theory papers, an Internal assessment and a practical. Each theory paper shall be of three hours duration and carry 50 marks. The practical shall be of 6 hours duration and carry 30 marks. Internal assessment carry 20 marks.

Theory Paper I	50 marks
Theory Paper II	50 marks
Practical	30 marks
Internal Assessment	20 marks
The distribution of marks in practical shall be as follows	Total - 150 marks

The distribution of marks in practical shall be as follows.
[A] Experiments,

20 marks

[B] Practical record [C] Viva 05 marks 05 marks

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Total - 30 marks

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- 3) The syllabus is based on six theory periods and six practical periods per week. Candidates are required to pass separately in theory, internal assessment and practical examination.
- 4) Students are expected to perform all the practicals mentioned in the syllabus.
- 5) Internal assessment: There shall be one internal assessment based on two theory papers for 10 Marks each. Total 20 Marks. The Internal assessment shall be conducted by the University approved teachers in the relevant subjects. The internal assessment shall be done by the respective college one month prior to the final exam of each semester. The Marks shall be sent to the university immediately after the internal assessment is over.
- 6) At the beginning of each semester, every teacher / department / college shall inform his / her students unambiguously the method teacher / department / college propose to adopt a scheme of marking for internal assessment.
- 7) The internal assessment marks assigned to each theory paper shall be awarded on the basis of attendance / home assignment / class test / Project assignment / seminar / any other innovative practice / activity.
- 8) The concerned teacher / department / college shall have to keep the record of all the above activities till six months after the declaration of result of that semester.

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## B. Sc. Part III –Semester VI - PAPER – I (APPLICATIONS OF BIOTECHNOLOGY)

## UNIT I

#### **Environmental Biotechnology**

Water and waste water treatment process: Current community drinking water treatment process, disinfection of water (chlorination and ozonation), primary, secondary and advanced treatment of sewage (domestic waste water),

Definition and concept of: biodegradation, biodeterioration and biotransformation.

## UNIT II

Xenobiotic and recalcitrant compounds. Bioaccumulation and biomagnification.

Assessment of water and wastewater quality: Concept of COD,DO and BOD. Indicators of faecal pollution and MPN and MF technique for coloforms. Significance and principal of IMViC.

## UNIT III

## **Industrial Biotechnology**

Basic Principles of Industrial Biotechnology: Important commercial products produced by microorganisms and GMOs and their applications, design of typical submerged fermentor, significance of various parts and provisions of fermentor, isolation of industrially important microorganisms – primary and secondary screening.

## UNIT IV

#### Food Biotechnology

Food Biotechnology: Production and types of cheese, microorganisms as food – production of mushroom and spirulina, assessment of microbiological quality of various foods. Industrial awareness: Quality control and quality assurance in food and pharamaceutical industry, concept of current good manufacturing practices in pharmaceutical industry

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## UNIT I: B. Sc. Part III – Semester VI - PAPER – II (PLANT & ANIMAL BIOTECHNOLOGY)

a) Introduction to cell and Tissue culture. Tissue culture as a technique to produce novel plants and hybrids,

Laboratory facilities

- b) Tissue culture media (composition and preparation)
- c) Callus and suspension cultures: initiation and maintenance of callus and suspension cultures; single cell clones.

## **UNIT II:**

- a) Tissue and micropropagation, suspension culture, callus formation, regeneration, production of haploids, protoplast culture and somatic hybridization
- b) Cloning in plants Ti plasmid.
- c) Concept of transgenic plants
- d) Bt cotton and other plant applications.

## **UNIT III:**

- a) Various techniques of animal cell and tissue culture, Culture media, growth factors, laboratory facilities.
- b) Characteristics of cells in culture: Contact inhibition, anchorage dependence, cell-cell communication etc.; Cell senescence; cell and tissue response to trophic factors.
- c) Primary culture, immortal cells, cell lines.
- d) Maintenance of cell lines in the laboratory.

## UNIT IV:

- a) Brief idea about recombinant DNA products in medicine (insulin, somatostatin, vaccines), Concept of Gene therapy,
- b) Production of recombinant vaccines hepatitis.
- c) Concept of transgenic animals
- d) In vitro fertilization and embryo transfer in humans and farm animals.

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#### B.Sc. III SEMESTER VI PRACTICALS Biotechnology

## Animal, Plant, Industrial & Environmental Biotechnology

- 1. Establishing a plant cell culture (both in solid and liquid media) seed germination, callus culture, suspension cell culture, regeneration from callus cells.
- 2. Anther culture, embryo culture, suspension culture.
- 3. Cell count by hemocytometer.
- 4. Cytology of callus.
- 5. Establishing primary cell culture of chicken embryo fibroblasts.
- 6. Animal tissue culture maintenance of established cell lines.
- 7. Animal tissue culture virus cultivation.
- 8. Measurement of cell size.
- 9. Microphotography.
- 10. IMViC test.
- 11. Determination of COD
- 12. Testing of chlorine demand of water

- 13. Microbiological quality assurance of any of the commercially available foods.
- 14. Bioassay of penicillin/vitamin B12
- 15. Determination of fecal coliforms by MPN technique/MF technique
- 16. Isolation of azotobacter and rhizobium.
- 17. Sterility testing of injectibles.
- 18. Assay of amylase
- 19. Determination of seed viability.

Note: - Mandatory to perform atleast 6 practical \*\*\*\*\*\*

## SYLLABUS for M. Sc. BIOTECHNOLOGY Choice Based Credit System (Semester Pattern) Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur Effective from 2015-2016

## Scheme of teaching and examination under semester pattern Choice Based Credit System (CBCS) for M.Sc. Program in Biotechnology

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Core 2	Paper 2:	4	-	4	4	3	80	20	100	40		
	Molecular											
	Biology											
Core 3	Paper 3:	4	-	4	4	3	80	20	100	40		
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Core 4	Paper 4:	4	-	4	4	3	80	20	100	40		
	Biophysical											
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2											
	TOTAL	1 8	16	34	25		520	10 5	625	17 0	80

		<b>M.</b> 5	Sc. Bio	techn	olog	y Ser	nester	· III			
Code		Tea scl (H	aching heme tours /				Ex	amina	tion S	cheme	3
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	Theory /	Th	Pract	Total	Credits	Duration	External Marks	Internal Ass	Total Ma	Th	Pract
Core 9	Paper 9: Genetic Engineerin g & it s Application s	4	-	4	4	3	80	20	100	40	
Core 10	Paper 10: Plant Biotechnol og y	4	_	4	4	3	80	20	100	40	
Core Electiv e 1	Paper 11: A) Industrial Biotechnolog y I OR B) Environme n tal Biotechnolo g y I	4	-	4	4	3	80	20	100	40	

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Pract.	Practical 6:	-	8	8	4	3-	100	-	100		40
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		<b>M.</b> §	Sc. Bio	techn	olog	y Ser	nester	· IV				
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Core 11	Paper 13	: 4	-	4	4	3	80	20	100	40		
	Animal											
	Biotechnol											

	g y										
Core 12	Paper 14: Biostatistics , Bioinforma ti cs, Ethics & Patenting	4	-	4	4	3	80	20	100	40	
Core Electiv e 2	Paper 15: A) Industrial Biotechnolog y II O R B) Environme n tal Biotechnol og y II	4	_	4	4	3	80	20	100	40	
Founda ti on Course 2 / Cor e Subject Centric 2	Paper 16: Molecular Biotechnol og y / Therapeuti c Medical Biotechnol og y	4	_	4	4	3	80	20	100	40	
Pract. Core 11, 12 & Electiv e 2	Practical 7: Animal Biotechnolo gy, Biostatistics, Bioinformat ics, Ethics & Patenting And A) Indust rial Biotechnolog y II OR B) Environm ental Biotechno logy	-	8	8	4	3- 8*	100 * *	_	100		40
Project	Project	-	8	8	4	3-	100	-	100		40

						8*	* *				
Seminar 4	Seminar 4	2	-	2	1			25	25	10	
	TOTAL	1 8	16	34	25		520	10 5	625	17 0	80

## NOTE Sem III & IV:

**Foundation Course:** Candidate can opt for any one foundation course paper in the semester III and IV. However, Student shall opt for this paper from any other subject other than his / her main subject for postgraduation. If the candidate decides to opt for foundation course papers then he/she shall not be eligible to opt for Core (Subject Centric) papers in their respective subjects.

**Core (Subject Centric)**: Candidate can opt for this paper as shown in the semester III and IV in their main subject of postgraduation only. If the candidate decides to opt for Core (Subject Centric) papers in their main subject of postgraduation then he/she shall not be eligible to opt for foundation course papers neither in their own subject nor in any other subject).

Semester I

## SYLLABUS for M. Sc. BIOTECHNOLOGY

#### Choice Based Credit System (Semester Pattern) Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur Effective from 2015-2016

Theory		
Paper I	Cell Biology and Enzymology	100 marks/4 Credits
Paper II	Molecular Biology	100 marks/4 Credits
Paper III	Biomolecules	100 marks/4 Credits
Paper IV	Biophysical Techniques	100 marks/4 Credits
Practical 1	Cell Biology and Enzymology	100 marks/4 Credits
Practical 2	Macromolecules & Analytical Techniques	100 marks/4 Credits
Seminar		50 marks/2 Credit

#### Semester II

Theory		
Paper I	Microbiology	100 marks/4 Credits
Paper II	Immunology	100 marks/4 Credits
Paper III	Fundamentals of Genetic Engineering	100 marks/4 Credits
Paper IV	Applied Molecular Biology	100 marks/4 Credits
Practical 1	Microbiology & Immunology	100 marks/4 Credits
Practical 2	Genetic Engineering & Molecular Biology	100 marks/4 Credits
Seminar		50 marks/2 Credit

Semester III

Theory			
Paper I	Genetic Engineering & its Applications	100 marks/4 Credits	
Paper II	Plant Biotechnology	100 marks/4 Credits	
Paper III	A) Industrial	100 marks/4 Credits	
(Core	Biotechnology I OR		
Elective A or B)	B) Environmental Biotechnology I		
Paper IV	Introductory Biotechnology	100 marks/4 Credits	
(Foundation	/		
Course / Core	Diagnostic Medical Biotechnology		
Subject Centric 1)			
Practical 1	Genetic Engineering & Plant Biotechnology	100 marks/4 Credits	

Practical 2	A) Industrial	100 marks/4 Credits
(Cor	Biotechnology OR	
e Elective A or B)	B) Environmental Biotechnology	
Seminar		50 marks/2 Credit

## Semester IV

Theory			
Paper I	Animal Biotechnology	100 marks/4 Credits	
Paper II	Biostatistics, Bioinformatics, Ethics & Patenting	100 marks/4 Credits	
Paper III	A) Industrial	100 marks/4 Credits	
(Core	Biotechnology II OR		
Elective A or B)	B) Environmental Biotechnology II		
Paper IV	Molecular Biotechnology	100 marks/4 Credits	
(Foundation	/		
Course / Core	Therapeutic Medical Biotechnology		
Subject Centric 1)			
Practical	Animal Biotechnology, Biostatistics,	100 marks/4 Credits	
	Bioinformatics, Ethics & Patenting		
	And		
	Industrial Biotechnology		
	II OR		
	Environmental Biotechnology		
Project Work		100 marks/4 Credits	
Seminar		50 marks/2 Credit	

#### M. Sc.

#### BIOTECHNOLO GY Semester I Paper – I Cell Biology and Enzymology

## UNIT I:

Structure and function of cell organelles:

Plasma membrane: transport of nutrients, ions and

macromolecules. Cell walls: Archaea, Bacteria, plant cells.

Mitochondria: Electron Transport Chain and Oxidative

Phosphorylation. Chloroplasts: Chlorophyll, carotenoids and

photosynthesis.

Golgi complex: Endoplasmic reticulum, lysosomes, peroxisomes (functions).

## UNIT II:

Cell cycle: Molecular events in S. cerevisiae. Cell signaling: Signal transduction in animal and plant cells (tyrosine kinase, light induced signaling)

## **UNIT III:**

Basic Enzymology

Basics: Enzyme nomenclature, classification and specificity. Concept of coenzymes.

Mechanism of enzyme action: Models, catalysis by proximity effect, acid-base catalysis, electrostatic interaction, metal ion catalysis, nucleophilic and electrophilic catalysis,

Concept of multienzyme complexes: fatty acid synthase and pyruvate dehydrogenase complexes. Concept of enzyme regulation: Allosteric (example ATCase), chemical modification and calmodulin mediated regulation.

## UNIT IV:

Basic aspects of enzyme kinetics: Michaelis-Menten equation (derivation, significance and transformation). Two substrate kinetics. Modifying factors of enzyme kinetics, enzyme inhibition and types of inhibitors. Enzyme Engineering Immobilization of Enzymes

## UNIT I:Sc. BIOTECHNOLOGY Semester I Paper – II Molecular Biology

DNA Replication: Prokaryotic and Eukaryotic DNA replication, mechanisms of DNA replication, fidelity of replication, enzymes and accessory proteins involved in DNA replication.

Gene mutations: Types of mutations. Suppression. Ames' test.

DNA Repair: Direct repair, Ada protein, NER, BER, MMR, SOS repair, Transcription-repair coupling, repair of double-strand breaks.

## UNIT II:

Prokaryotic Transcription: RNA Polymerase holoenzyme and apoenzyme, different sigma factors, details of initiation, elongation, termination.

Eukaryotic Transcription: Three types of RNA polymerases. Promoter of RNA polymerase II. Enhancers. General and inducible transcription factors.

Modifications of RNA: 5' cap formation, polyadenylation, splicing of nuclear pre-mRNA, mRNA stability.

## UNIT III

Genetic code: characteristics, deciphering the code.

Protein biosynthesis: Prokaryotic and eukaryotic translation, the translational machinery, mechanism of initiation, elongation and termination.

## UNIT IV

Regulation of expression in prokaryotes: lac operon, ara operon, trp operon, negative autogenous control.

Regulation of expression in eukaryotes: Britten-Davidson model. DNA binding and activation domains of

transcription factors. Packaging of chromosomes and its relation to transcription regulation. Regulation of translation by 3' and 5' UTR motifs.

## M. Sc.

## BIOTECHNOLO GY Semester I Paper – III Biomoleculs

## UNIT I:

Chemistry of Carbohydrates: Energy storage molecules – starch, glycogen. Building blocks – cellulose, hemicellulose, and chitin. Cell surface molecules – glycolipids, proteoglycans.

## UNIT II:

Chemistry of Lipids: Triglycerides, phospholipids, glycolipids, sphingolipids, sterols, terpenes, lipoproteins (LDL, VLDL, HDL, IDL). Lipid micelles, Liposomes.

## **UNIT III:**

Proteins: Amino acids and peptides. Primary, secondary, and tertiary structures. Protein sequencing, protease mapping. Ramachandran plot. Collagen structure. Domain structure, models of protein folding, methods of study of protein folding, roles of chaperones and chaperonins.

## UNIT IV:

Nucleic acids: Structure of DNA and RNA: A, B, and Z forms of DNA. Novel structures. DNA bending and bendability. Denaturation and renaturation studies and their applications, nucleic acid hybridization. Topological structure of DNA.

## M. Sc.

#### BIOTECHNOLO GY Semester I Paper – IV Biophysical Techniques

## UNIT I:

Spectrophotometry: UV-Visible spectrophotometry, fluorescence spectrophotometry, absorption and emission spectrophotometry, IR, NMR, Lumionometry. Basic introduction to Raman and Mass spectrophotometry.

## **UNIT II:**

Chromatography: Basic principles and techniques of partition, adsorption, gel filtration, affinity, and ion exchange chromatography. Concept of GLC and HPLC.

## **UNIT III:**

Electrophoresis: Gel electrophoresis (Agarose, PAGE, SDS PAGE), Disc gel electrophoresis, Gradient electrophoresis, Pulsed field gel electrophoresis, capillary electrophoresis. Viscosity: Determination of conformational changes through viscosity.

## **UNIT IV:**

Centrifugation

Basic principles, Mathematics & theory (RCF, Sedimentation

coefficient etc) Types of centrifuge: microcentrifuge, high speed &

ultracentrifuges.

Differential & density gradient centrifugation, Isolation of cell components using centrifugation technique. Radioactivity

Radioactive & stable isotopes, Pattern and rate of radioactive decay, Units of radioactivity. Measurement of radioactivity: Geiger-Muller counter, Solid & Liquid scintillation counters (Basic principle, instrumentation & technique),

Applications of isotopes in Biotechnology: Principles of tracer techniques, Its advantages and limitations, Distribution studies, Isotope dilution technique, Metabolic studies, Clinical application. Radioimmunoassay.

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## M. Sc.

#### BIOTECHNOLO GY Semester I LAB I Cell Biology and Enzymology

- 1. Determination of activity of calcium ATPase of plasma membrane.
- 2. Subcellular fractionation and assay of marker enzymes.
- 3. Assay of activity of LDH.
- 4. Cell motility and flagellar staining.
- 5. Cell types of plants- maceration of various tissue explant and identification of xylem, trachied, stomata, root hair, etc.
- 6. Determination of activity of sodium/potassium ATPase of plasma membrane.
- 7. Isolation of neutrophils and demonstration of phagocytosis.
- 8. Determination of osmotic fragility of RBC membrane.

- 9. Assay of activity of beta-galactosidase
- 10. Assay of activity of acid phosphatase,
- 11. Enzyme purification by crystallization urease.
- 12. Immobilization of enzymes (Invertase/ Protease/ Amylase.) by Na alginate method.
- 13. Whole cell immobilization (Yeast) by Na Alginate and the estimation of alcohol produced.
- 14. Effect of NaCl on amylase activity
- 15. Inhibition of alkaline phosphatase activity by EDTA
- 16. Estimation of lipase activity by titrimetric method
- 17. Effect of Temperature on activity of Amylase / Alkaline phosphatase and determination of optimum temperature.
- 18. Effect of Substrate concentration on activity of Amylase / Alkaline phosphatase and determination of optimum substrate concentration.
- 19. Effect of pH on activity of Amylase / Alkaline phosphatase and determination of optimum pH
- 20. Isolation of chlorophyll and xanthophyll from spinach leaves.
- 21. Effect of inhibitors on respiratory chain.
- 22. Study of Mitosis and Meiosis
- 23. Study of mutations by Ames Test.
- 24. Assay of Activity of SGOT & SGPT.
- 25. Isolation, Purity determination and quantitation of DNA by UV method.

Note: Candidates must perform at least 6 practicals in the semester.

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M. Sc.

## BIOTECHNOLO GY Semester I

## LAB II

## Macromolecules & Analytical Techniques

- 1. Separation of proteins / lipids by ion exchange chromatography
- 2. Separation of lipids / amino acids by thin layer chromatography
- 3. Polyacrylamide gel electrophoresis: a) native enzyme preparation, b) SDS-PAGE of proteins.
- 4. Introduction to measurements: balance and pipetting, preparation of solutions of given molarity and normality.
- 5. Measurement of pH: buffering capacity, to determine pKa value and hence the dissociation constant of a given acid using pH meter.
- 6. Colorimetry: To determine the dissociation constant of a given indicator colorimetrically and to prepare buffer solutions in the pH range 2.2 to 8.0
- 7. Colorimetry: Assay of DNA by diphenylamine method.
- 8. Colorimetry: Assay of RNA by orcinol method.
- 9. Potentiometry: To determine redox potential of Fe++ and Fe+++.
- 10. Conductometry: to determine cell constant of 0.1 M KCl.
- 11. Conductometry: Titration of strong acid vs strong base, to find out equivalent conductance of salt formed.
- 12. Viscometry: Effect of temperature on the viscosity of DNA using Ostwald's viscometer.
- 13. Viscometry: To determine molecular weight of protein and DNA.
- 14. Viscometry: To determine changes in the conformation of bovine serum albumin by viscosity measurements, effect of pH on conformation of BSA.
- 15. Spectrophotometry: To study the absorption spectrum of hemoglobin and NADH
- 16. Determination of Tm of nucleic acid
- 17. The validity of beers law for colorimetric estimation of creatinine.
- 18. The ultraviolet absorption of proteins and amino acids.
- 19. Estimation of proteins by Lowry's and Bradford method.
- 20. Estimation of protein by E280/E260 method.

21. Fractionation of proteins: Salt precipitation, solvent precipitation, isoelectric precipitation, dialysis, centrifugation.

Note: Candidates must perform at least 6 practicals in the semester.

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M. Sc. Sem I Seminar UNIT I: Eukaryae and Viruses M. Sc. BIOTECHNOLOGY

## Semester II Paper – I Microbiology

- Algae: General characteristics, Applications in biotechnology.
- Fungi and slime moulds: General characteristics, applications in biotechnology.
- Viruses: Nature, symmetry, capsid structure, nucleic acid.
- Quantification of viruses
- Life cycles: T4 and lambda.
- Viroids and prions.

## UNIT II:

General Microbiology and Taxonomy

- Prokaryotes: bacterial structure and morphology, endospore forming bacteria, pseudomonas, mycobacteria, archaebacteria.
- Microbial classification: 16s rRNA sequence and bacterial phylogeny.
- Bacterial genetic system: recombination (transformation, conjugation, transduction and transposition) Plasmids, salient features of the E. coli genetic map.

## **UNIT III:**

Microbial Physiology

- Nutrition: nutritional classification, behavior, cultivation, isolation, media and their types, maintenance of culture.
- Growth: Measurement of growth, growth curve, continuous and synchronous culture, factors affecting microbial growth.

## UNIT IV:

Microbial Control

- Microbial control: methods and dynamics of sterilization, mechanisms of control, biocontrol and preservation.
- Concept of chemotherapy, chemotherapeutic agents, mechanisms of action.
- Drug resistance, MDR, assessment and management of drug resistance.

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## UNIT I:

#### M. Sc. BIOTECHNOLOGY Semester II Paper – II Immunology

#### Immunology- fundamental concepts and anatomy of the immune system

Components of innate and acquired immunity; Organs and cells of the immune system- primary and secondary lymphoid organs; Lymphatic system;; Mucosal and Cutaneous associated Lymphoid tissue.(MALT&CALT); Mucosal Immunity; Antigens - immunogens, haptens; Major Histocompatibility Complex - MHC genes, HLA typing, flow cytometry, Microarrays.

## **UNIT II:**

## Immune responses generated by B and T lymphocytes

Immunoglobulins-basic structure, classes & subclasses of immunoglobulins, antigenic determinants; Basis of self —non-self discrimination; B cell maturation, activation and

differentiation; Generation of antibody diversity; T-cell maturation, activation and differentiation and T-cell receptors; Cell-mediated immune responses, ADCC; Cytokines-properties, receptors and therapeutic uses, Hapten-carrier system

## UNIT III: Vaccinology

Active and passive immunization; Live, killed, attenuated, sub unit vaccines; Vaccine technology-Role

and properties of adjuvants, recombinant DNA and protein based vaccines, plant-based vaccines, reverse vaccinology; Peptide vaccines, conjugate vaccines; Antibody genes and antibody engineering- chimeric and hybrid monoclonal antibodies; Catalytic antibodies and generation of immunoglobulin gene libraries.

## UNIT IV:

## **Clinical Immunology**

Hypersensitivity — Type I-IV; Autoimmunity; Types of autoimmune diseases; Mechanism and role of CD4+ T cells; MHC and TCR in autoimmunity; Treatment of autoimmune diseases; immunosuppressive therapy; Cancer immunotherapy. Apoptosis, transgenic mice, Gene knock outs.

## UNIT I:M. Sc. BIOTECHNOLOGY Semester II

## Paper – III Fundamentals of Genetic Engineering

- Restriction endonucleases and modification methylases
- Other enzymes needed in genetic engineering: exonucleases and endonucleases, ligases, polymerases, DNA modification enzymes and topoisomerases.
- Gene isolation and purification: general methods (shotgun method for producing gene library, cloning specific genes by hybridization and reverse transcriptase methods, direct selection of a gene)

## **UNIT II:**

• Insertion of DNA and ligation: Berg's terminal transferase method (dA:dT joints); Boyer-Cohen-Chang experiment (cohesive ends), Butt joints (T4 DNA ligase); current ligation techniques (blunt-end ligation, complementary end ligation, linkers, adaptors, homopolymer tailing.

## UNIT III:

Construction of Genomic DNA library and its applications

- Construction of cDNA Library: Method, problems to be addressed, advantages and disadvantages compared to the genomic DNA library, uses
- Screening of recombinants: Screening by complementation, southern hybridization, northern hybridization, colony lift, western blotting, immunoprecipitation, south-western screening. Synthesis and labeling of probes.
- DNA sequencing: Sanger-Coulson dideoxynucleotide method, Maxam-Gilbert chemical cleavage method, multiplex DNA sequencing, automated DNA sequencing. Basic idea of oligonucleotide synthesis.

## UNIT IV:

Cloning vectors

- Plasmids as vectors, general characteristics of plasmids, bacterial vector plasmids, yeast vector plasmids,
- yeast artificial chromosomes
- Phage Vectors (lambda, M13).

## • Cosmid vectors.

• Animal virus derived vectors – SV 40 and retroviral vectors

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## M. Sc. BIOTECHNOLOGY Semester IIPaper – IV Applied Molecular Biology

## UNIT I:

Recombination and Genome Mapping, Homologous recombination: Holiday junction, gene targeting, gene disruption, FLP/FRT and Cre/Lox recombination, RecA and other recombinases.

• Molecular mapping of genome: Genetic and physical maps, choice of mapping population, southern and fluorescence in situ hybridization for genome analysis, RFLP, RAPD, and AFLP analysis, molecular markers linked to disease resistance genes, application of molecular markers in forensic, disease prognosis, genetic counseling, pedigree etc.

## UNIT II:

Antisense, Ribozymes and Epigenetics

- Antisense and ribozyme technology: Molecular mechanism of antisense molecule, biochemistry of ribozyme, hammerhead ribozymes, applications of antisense and ribozyme technologies.
- Epigenetics: chromatin marking systems, Direct chemical modification of DNA, Basic concepts of RNAi.

## **UNIT III:**

Cancer Biology

- Methods to study cancer: Animal models. Role of tissue culture in study of cancer. Combination of tissue culture and animal models.
- DNA Viruses and cancer: Polyoma virus, SV40, adenovirus
- Genetics of Cancer: Oncogenes (ras, myc), suppressor genes (p53, Rb).

## UNIT IV:

- Angiogenesis: Brief idea of healthy vasculature, definition of angiogenesis, basic process of tumor induced angiogenesis, Hypoxia induced factor (HIF), basics of pro- and anti- angiogenic factors, positive and negative factors affecting angiogenesis.
- Metastatsis: Stages of metastatic progression, prerequisites for metastasis (properties a cell must acquire for metastasis), epithelial-mesenchymal transition, biochemical parameters acquired by metastatic cells.
- Basic idea of Cancer stem cells.

M. Sc.

#### BIOTECHNOLO GY Semester II LAB I Microbiology & Immunology

- 1. Production of microbial products in bioreactors/fermentors.
- 2. Immobilization of cells/enzymes.
- 3. Cleanliness, media preparation, sterilization, culturing methods, dilution techniques.
- 4. Staining techniques in microbiology; simple staining, gram staining, spore staining capsule staining, flagella staining.
- 5. Isolation of pure culture by different techniques.
- 6. Replica plating technique.
- 7. Propagation of viruses.

- 8. Assay of viruses.
- 9. Purification of immunoglobulins, qualitative assessment.
- 10. Demonstration of immunochemical reactions (blood group, Widal, VDRL, pregnancy, ELISA)
- 11. Blood film preparation and identification of cells.
- 12. Ouchterlony immunodiffusion,
- 13. Determination of albumin by radial immunodiffusion.
- 14. Biochemical tests for identification of Bacteria Oxidase, catalase, IMViC test, etc.
- 15. Isolation of antibiotic resistant bacteria from waste / sewage water.
- 16. Motility of bacteria by hanging drop method.
- 17. Assay of antibiotics by disc diffusion method.

#### Note: Candidates must perform at least 6 practicals in the semester.

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#### M. Sc.

## BIOTECHNOLO

## GY Semester II

## LAB II

## Genetic Engineering & Applied Molecular Biology

- 1. Induction of  $\Box$ -galactosidase in strains of E. coli (I+ and I-).
- 2. Southern blotting.
- 3. Isolation of genomic DNA.
- 4. Western blotting.
- 5. Endonuclease digestion of DNA and analysis of DNA fragments by agarose electrophoresis.
- 6. Isolation of RNA.
- 7. Restriction fragment length polymorphism.
- 8. Ames test.
- 9. Isolation of plasmid DNA (miniprep and alkaline bulk method)
- 10. Isolation of RNA
- 11. Isolation of polyA RNA using oligodT columns
- 12. Estimation of RNA by Orcinol method
- 13. Estimation of DNA by diphenylamine method
- 14. Estimation of DNA by E260 method
- 15. Isolation of Lambda phage DNA.

#### Note: Candidates must perform at least 6 practicals in the semester.

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## M. Sc. Sem II Seminar

## UNIT I:

## M. Sc. BIOTECHNOLOGY

## Semester III Paper – I

#### Genetic Engineering & its Applications Transformation: DNA

uptake by bacterial cells.

- Transfection: Chemical and physical methods, Viral vectors. Polyethylene glycol, DEAEdextran, calcium phosphate coprecipitation, dimethyl sulfoxide, liposomes, microinjection, macroinjection, electroporation, biolistics, somatic cell fusion, gene transfer by pronuclear microinjection
- Amplification of DNA: Polymerase chain reaction.

## UNIT II:

Plant transformation technology: Basis of tumor formation, hairy root, features of Ti and Ri

plasmids, mechanism of DNA transfer, role of virulence genes, use of Ti and Ri as vectors, binary vectors, use of 35S and other promoters, genetic markers, use of reporter genes, use of scaffold attachment regions, methods of nuclear transformation, viral vectors and their application, Biological and physical transformation methods. Chloroplast transformation.

## UNIT III:

- Expression of heterologous genes: expression of eukaryotic genes in bacteria, expression of heterologous genes in yeast, insect and mammalian cells.
- Salient features of expression vectors.
- Processing of recombinant proteins: Refolding and stabilization.
- Industrial Products of Protein engineering

## UNIT IV:

- Phage Display: Production of monoclonal bodies by phage display technique using filamentous phage vectors.
- Gene Therapy: somatic and germline, gene replacement, in vivo and ex vivo gene delivery, retrovirus gene transfer system, advantages and disadvantages of adenovirus, adeno-associated virus, herpes virus vectors, gene correction, replacement/augmentation, editing, regulation and silencing. Gene therapy of human diseases

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## M. Sc.

## BIOTECHNOLOG Y Semester III Paper – II Plant Biotechnology

## UNIT I:

- Conventional plant breeding (introductory).
- Introduction to cell and Tissue culture. Tissue culture as a technique to produce novel plants and hybrids.
- Tissue culture media (composition and preparation)
- Callus and suspension cultures: initiation and maintenance of callus and suspension cultures; single cell clones.
- Organogenesis. Embryogenesis; transfer and establishment of whole plants in soil.

## UNIT II:

- Shoot tip culture: rapid clonal propagation and production of virus free plants.
- Embryo culture and embryo rescue.
- Hybrid plants: protoplast isolation, culture and fusion, selection of hybrid cells and regeneration of hybrid plants, symmetric and asymmetric hybrid, cybrid.
- Production of haploid plants: anther, pollen and ovary cultures for production of haploid plants and homozygous lines.
- Germplasm conservation: cryopreservation, slow growth cultures and DNA banking for germplasm conservation.

## **UNIT III:**

- Applications of plant transformation for productivity and performance
- Herbicide resistance, phosphoinothricine glyphosate, sulfonyl urea, atrazin, insect resistance, Bt genes, non-Bt-like protease inhibitor, virus resistance, coat protein mediated nucleocapsid gene, disease resistance, chitinase, 1-3 beta glucanase, RIP,
- antifungal proteins, thionins, PR proteins, nematode resistance, abiotic stress, post harvest losses, long shelf life of fruits and flowers, use of ACC synthase, polygalacturanase, ACC oxidase, male sterile lines, bar and barnase systems, carbohydrate composition and storage, ADP glucose pyrophosphatase.

## UNIT IV:

- Plant metabolic engineering and industrial products: plant secondary metabolites, control mechanisms and manipulation of phenylpropanoid pathway, shikimate pathway, alkaloids, industrial enzymes, biodegradable plastics, polyhydroxybutyrate, therapeutic proteins, lysosomal enzymes, antibodies, edible vaccines, purification strategies, oleosin partitioning technology.
- Molecular marker aided breeding: RFLP maps, linkage analysis, RAPD markers, STS, microsatellite, SCAR (sequence characterized amplified regions), SSCP (single strand conformational polymorphism), QTL, map based cloning, molecular marker assisted selection.
- Green House Technology

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M. Sc.

#### BIOTECHNOLOG Y Semester III

(NOTE: Candidates can choose any one elective paper from Core elective A or B)

## Paper – III (Core Elective A) Industrial Biotechnology I

## UNIT I:

## **Bioreactors:**

- Bioreactor function, utility, types of bioreactor. Modes of bioreactor operations. Main components of the bioreactor and their functions.
- Bioreactors
  - a) Design/configuration of a basic fermentor; individual parts and probes for on-line monitoring of process.
  - b) Concept of Batch and Continuous process, fed-batch semi-continuous systems; aerobic and anaerobic fermentors
  - c) Submerged/liquid state and solid state fermentations

## UNIT II

## **Types of Bioreactors:**

- Continuous stirred tank and plug flow reactors
- Packed bed and fluidized bed reactors
- Trickle bed, immobilized bed, air lift, rotary disc reactors. Reactors with cell recycle.

## **UNIT III:**

## Immobilized reactor systems:

- Immobilization techniques for cells (physical adsorption, ionic binding, covalent binding, lattice entrapment, membrane entrapment, micro encapsulation) and enzymes (covalent binding, entrapment, micro encapsulation, cross-linking, adsorption, ionic binding, affinity binding, chelation, disulfide bonds)
- Immobilized enzyme kinetics
- Types of immobilized reactors

## **UNIT IV:** Scope of Downstream Processing:

• Importance of Down Stream Processing (DSP) in biotechnology, characteristics of products, criteria for selection of bio-separation techniques. Role of DSP methods in bioprocess economics. Cell Disruption Methods: Various cell disruption methods, need for cell disruption for (Homogenizer, French press & Dynomill) intracellular products, cell disruption equipment. Applications in bio-processing. Flocculation: Principles of flocculation various flocculating agents, applications in bio-processing. Coagulation: Principles of coagulations and its applications in bio-processing

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#### M. Sc.

## BIOTECHNOLOG Y Semester III (NOTE: Candidates can choose any one elective paper from Core elective A or B)

#### Paper – III (Core Elective B) Environmental Biotechnology I Environmental Science & Bioresources

#### UNIT I:

Introduction to environmental Science: Environmental ethics: Environmentalism, Environment & Religion, Environmental education, Need for environmental education. Environmental Pollution: Classification of pollutants, Air pollution and their properties, Gaseous pollutants, water pollutants and their properties. Noise pollution, Soil pollution, thermal pollution, marine pollution, solid water pollution.

#### **UNIT II:**

Ecosystem structure and functions, abiotic and biotic component, Energy flow, food chain, food web, Ecological Pyramids-types, biogeochemical cycles, ecological succession, Ecads and ecotypes. Biotechnological processes: Bioconversion, Bioaccumulation, Bioconcentration, Biomagnification, Biodegradation.

#### **UNIT III:**

Energy & Biofuels: Non conventional or renewable sources of energy, Energy from Biomass, Biofertilizers, Biosensors and biochips, Biofilters, Biofuel cells,

#### **UNIT IV:**

Biofertilizers, Biopestisides and Integrated pest management: Bacterial biofertilizers, algal biofertilizers, Aquatic ferns as biofertilizers, Fungi as biofertilizers, earthworm as biofertilizers, biopestisides, Integrated pest management.

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M. Sc.

BIOTECHNOLOG Y Semester III (NOTE: Candidates of other M. Sc. Subjects can choose this paper from Biotechnology subject) Paper – IV (Foundation Paper I) Introductory Biotechnology

UNIT I: Basics of Proteins

- Amino acids: Structures of amino acids found in proteins, classification, peptide bond structure; Protein Structure:
- Primary (basic idea of sequencing and amino acid composition), secondary (alpha and beta structures), tertiary and quaternary structures

## UNIT II:

## Nucleic acids

• Nucleoside, Nucleotides, Bases; Basic Structure of DNA (Watson Crick structure) and RNA.

## UNIT III:

## Genes and chromosomes

• Gene definition, prokaryotic and eukaryotic gene structure; Structure of chromatin (nucleosome, 30 nm fiber, solenoid structure); basic understanding of chromosome structure; centromeres, telomeres, Unique genes and gene families

## UNIT IV:

## Enzymes

• Overview, Enzyme classification with specific examples. Characteristics of enzymes, Concept of

active centre, binding sites, stereospecificity and ES complex formation. Effect of temperature, pH and substrate concentration on reaction rate. Enzyme activity, international units, specific activity

• Introduction to Enzymes used in biotechnology: Restriction enzymes, exonucleases and endonucleases, ligases, polymerases, DNA modification enzymes and topoisomerases

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## M.Sc. Biotechnology (CBCS) Semester-III (Candidate can opt for this paper in their main subject of postgraduation ONLY). Paper-IV: (Core Subject Centric I) Diagnostic Medical Biotechnology

# Molecular and Nanomolecular Diagnostics Unit I

Host pathogen interactions in disease process (Bacterial: Tuberculosis and Staphylococcal Diseases & Viral: Influenza and HIV/AIDS); Disease pathology and clinical spectrum; Clinical diagnosis of diseases; Molecular Genetics of the host and the pathogen. Molecular techniques for analysis of these disorders; Assays for the Diagnosis of inherited diseases; Bioinformatic tools for molecular diagnosis.

## Unit II

Concept of Genomics, Human disease genes; DNA polymorphism including those involved in disease (Ex: Hemoglobin and the anemias); Phenylketonuria (monogenic) and diabetes (multigenic) genetic disorders; 'disease' gene vs. 'susceptibility' gene; SNP detection: hybridization based assays (allele specific probes); Polymerization based assays (allele specific nucleotide incorporation, allele-specific PCR); Ligation based assays (allele specific oligonucleotide ligation); Polymorphism detection without sequence information: SSCP. Single nucleotide polymorphism and disease association; High throughput DNA sequencing and diagnosis; and Array based techniques in diagnosis.

## Unit III

Outline of a typical proteomics experiment, clinical proteomics and disease biomarkers. Isolation of proteins and other molecules associated with disease; 2D analysis of such proteins by sequencing individual spots by Mass Spectrometry; Protein Microarray; Present methods for diagnosis of

Specific diseases like Tuberculosis and AIDS; Ethics in Molecular Diagnosis **Unit IV** 

Nanomolecular diagnostics and Biosensor: Introduction to Nanodiagnostics, Nanoarrays for diagnostics, detection of single DNA, self-assembled protein nanoarrays, protein nanobiochip nanoparticles for molecular diagnostics, DNA nanomachines, Nanobiosensor, CNT biosensor, DNA nanosensor, Nanowire biosensor, application of nanodiagnostics.

## **Texts/References**

1. George Patrinos and Wilhelm Ansorage, Molecular Diagnostics, 1st Edition, Academic Press, 2005.

 Willey J. Prescott, Harley, and Klein's Microbiology-7th international ed./Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton. New York: McGraw-Hill Higher Education; 2008.
Lela Buchingham and Maribeth L Flawsm, Molecular Diagnostics: Fundamentals, Methods and

Clinical Applications, 1st Edition, F A Davis Company, Philadelphia, USA, 2007.

4. Campbell, M.A and Heyer L.J., Discovering Genomics, Proteomics and Bioinformatics, 2nd

Edition, CSHL Press, Pearson/Benzamin Cummings San Francisco, USA, 2007.

5. Andrew Read and Dian Donnai, New Clinical Genetics, Scion Publishing Ltd, Oxfordshire, UK, 2007.

6. Challa S.S.R. Kumar, Nanomaterials for medical diagnosis and therapy, Viley-VCH, 2007.

7. Dr.Parag Diwan and Ashish Bharadwaj (Eds), Nano Medicines, Pentagon Press, 2006.

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#### M. Sc. BIOTECHNOLOGY Semester III LAB I Genetic Engineering & Plant Biotechnology

- 1. Recombinant DNA technology: in vitro DNA ligation and transformation of E. coli.
- 2. Recombinant DNA technology: characterization of transformants.
- 3. Northern blotting
- 4. Agarose gel electrophoresis and restriction mapping of DNA.
- 5. Construction of restriction map of plasmid DNA
- 6. Cloning in plasmid/phagemid vectors.
- 7. DNA sequencing.
- 8. Gene expression in E coli and analysis of gene product
- 9. Demonstration of technique of PCR
- 10. Demonstration of technique of RT-PCR
- 11. Replica plating technique.
- 12. Propagation of viruses.
- 13. Endonuclease digestion of DNA and analysis of DNA fragments by agarose electrophoresis.
- 14. Restriction fragment length polymorphism.
- 15. Ames test.
- 16. Quantitation of DNA by various methods.
- 17. Preparation of plant tissue culture media.
- 18. Surface sterilization.
- 19. Organ culture.
- 20. Callus propagation, organogenesis, transfer of plants to soil.
- 21. Protoplast isolation and culture.
- 22. Anther culture: production of haploids.
- 23. Cytological examination of regenerated plants.
- 24. Micropropagation of banana, citrus Papaya, Sugarcane etc.
- 25. Effect of various growth hormones on cell divisions and cell proliferation

- 26. Isolation, purification and culture of protoplast
- 27. Artificial seed preparation
- 28. Cytological examination of regenerated plants
- 29. Agrobacterium culture and selection of transformants.
- 30. Hardening of tissue culture raised plants.
- 31. Transfer of plants to soil.

#### Note: Candidates must perform at least 6 practicals in the semester.

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## M. Sc.

#### BIOTECHNOLOG Y Semester III LAB II (Core Elective A) Industrial Biotechnology

- 1. Immobilization of cells/enzymes
- 2. Determination of rheological constant.
- 3. Determination of oxygen transfer rate, volumetric transfer coefficient.
- 4. Microbial production of Alcohol
- 5. Microbial production of antibiotics
- 6. Production of microbial products in fermentors / bioreactors
- 7. Preparation and formulation of microbial biopestisides / biofertilizers.
- 8. Study of patenting procedure
- 9. Preparation of proposal for patenting.

#### Note: Candidates must perform at least 6 practicals in the semester.

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#### M. Sc. BIOTECHNOLOGY Semester III LAB II (Core Elective B) Environmental Biotechnology

- 1. Detection of coliforms for determination of the purity of potable water.
- 2. Determination of total dissolved solids of water
- 3. Determination of Hardness and alkalinity of water sample.
- 4. Determination of dissolved oxygen concentration of water sample
- 5. Determination of biological oxygen demand of sewage sample
- 6. Determination of chemical oxygen demand (COD) of sewage sample.
- 7. Analysis of oligodynamic action.
- 8. Determine the efficiency of removal of air pollutant using fibrous air filter.
- 9. Preparation and formulation of microbial biopesticide (bacteria, fungi and viruses
- 10. Production of microbial fertilizers (Rhizobium, Azotobacter and AMF).

#### Note: Candidates must perform at least 6 practicals in the semester.

M. Sc. Sem III Seminar

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#### M. Sc. BIOTECHNOLOGY Semester IV Paper – I Animal Biotechnology

#### UNIT I:

- Animal Cell Culture: Equipments and materials for animal cell culture technology. Various systems of tissue culture, their distinguishing features, advantages and limitations.
- Culture medium: natural media, synthetic media, sera. Introduction to balanced salt solutions and simple growth medium. Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, role of carbon di oxide, serum and supplements.
- Characteristics of cells in culture: Contact inhibition, anchorage dependence, cell-cell communication etc.; Cell senescence; cell and tissue response to trophic factors.

## UNIT II:

- Primary Culture: Behavior of cells, properties, utility. Explant culture; suspension culture.
- Established cell line cultures: Definition of cell lines, maintenance and management; cell adaptation.
- Measurement of viability and cytotoxicity. Cell cloning, cell synchronization and cell manipulation. Various methods of separation of cell types, advantages and limitations; flow cytometry.

## **UNIT III:**

- Scaling up of animal cell culture. Cell transformation.
- Stem cell cultures, embryonic stem cells and their applications. Somatic cell genetics.
- Apoptosis: Measurement of cell death. Apoptosis (death domain, role of cytochrome C)

## UNIT IV:

- Commercial applications of cell culture: Tissue culture as a screening system; cytotoxicity and diagnostic tests. Mass production of biologically important compounds (e.g. Vaccines). Harvesting of products, purification, and assays.
- Three dimensional cultures and tissue engineering.

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#### M. Sc. BIOTECHNOLOGY Semester IV Paper – II Biostatistics, Bioinformatics, Ethics & Patenting

## UNIT I:

#### **Biostatistics**

- Measures of central tendency: mean, mode, and median.
- Measures of dispersion: range, mean deviation, standard deviation.
- Methods of sampling, sampling error, non-sampling errors, standard error.
- Chi-square test, meaning of correlation and regression.
- Cluster analysis: phylogenetic clustering by simple matching coefficients.
- Presentation of statistical data: tabulation (simple tables, frequency distribution table); charts and diagrams (bar charts, histograms, pie charts, dendrogram).
- Research designs with basic principles and field layout.

#### UNIT II: Bioinformatics

- Computer concept: computer organization, hardware, software, operating system (windows, unix, brief list of computer languages).
- Concept of networking: internet, internet concepts, web browsing, public domain resources in biology.
- Concept of database management: brief idea of data types, data structures, searching, sorting, designing a database, genomic, proteomic, and metabolic pathways databases.
- Computer analysis of genetic sequences: general concepts of sequence analysis, identification of functional sequences, homology, brief idea of BLAST, ENTREZ, and PuBMed.
- Proteomics: basic issues and concepts, protein sequences and alignment, protein structure prediction.
- Bioinformatics tools in drug design.

## UNIT III:

## **Ethics:**

• Benefits of biotechnology, ELSI of biotechnology, recombinant therapeutic products for human health care, genetic modifications and food consumption, release of genetically engineered organisms, applications of human genetic rDNA research, human embryonic stem cell research.

## UNIT IV:

## Patenting

• Patent and Trademark, Biotechnology products and processes, Intellectual property rights, Plant breeders rights, biotechnology in developing countries. Biosafty and its implementation, Quality control in Biotechnology.

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## M. Sc. BIOTECHNOLOGY

#### Semester IV

#### (NOTE: Depending on the Core elective subject chosen in Semester III, Candidates shall pursue the same core elective subject in semester IV) Paper – III (Core Elective A) Industrial Biotechnology II

## UNIT I:

## **Bioprocess Engineering Concepts:**

• Mass transfer, heat transfer, mixing, rheology of fermentation fluids, residence time distribution, substrate utilization and yield-coefficients, oxygen transfer and oxygen sag.

## **UNIT II:**

## **Process Optimization and Control:**

- Optimization parameters, medium formulation, process optimization techniques:classical, Plackett-Burman design, ANOVA, central; composite design, response surface methodology with example.; medium formulation: classical, experimental design technique, fractional factorial design with egs.
- Concept of control: turbidostatic and chemostatic control, open loop and feedback control
- Advanced control policies: model predictive control, cascade control, PID control, programmed control

## UNIT III: Scale up & Biosensor Technology:

- basic principles of scale-up
- bases of scale up, scale down

• Biosensors

## UNIT VI: Production of Primary & Secondary Metabolite: 1. Primary Metabolites:

• A brief outline of processes for the production of some commercially important organic acids (e.g. citric acid, lactic acid, acetic acid etc.); amino acids (glutamic acid, phenyalanine, aspartic acid etc.) and alcohols (ethanol, butanol etc.)

## 2. Secondary Metabolites:

• Brief Study of production processes for various classes of secondary metabolites: antibiotics: betalactams (penicillin), aminoglycosides (streptomycin) macrolides (erythromycin), vitamins and steroids.

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## M. Sc. BIOTECHNOLOGY

## Semester IV

#### (NOTE: Depending on the Core elective subject chosen in Semester III, Candidates shall pursue the same core elective subject in semester IV) Paper – III (Core Elective B) Environmental Biotechnology II Applied Environmental Biotechnology

## UNIT I:

Bioremediation & Phytoremediation: Biofeasibility, applications of bioremediation, Bioreduction, Phytoremediation.

Solid waste pollution and its management: Current practice of solid waste management, composting systems, vermicomposting, sewage treatment.

## UNIT II:

Bioabsorption and Bioleaching of heavy metals: Cadmium, Lead, Mercury, Metal binding targets and organisms, Bioabsorption, Metal microbial interaction, Biomethylation of elements (Methylation of mercury and arsenic), Commercial biosorbants, bioleaching, metal precipitation, advantages and disadvantages of bioleaching.

## UNIT III:

Waste water Treatment: Biological treatment system (Oxidative ponds, aerobic and anaerobic ponds, facultative ponds, aerated ponds), Biological waste treatment, activated sludge treatment, microbial pollution in activated sludge, percolating filters, waste water treatment by biofilms. Treatment scheme of Dairy, Distillery, Tannery, Sugar, Fertilizers, Refinery, Chemical and Antibiotic waste.

## UNIT IV:

Xenobitics in environment: Biodegradation of Hydrocarbons, Substituted hydrocarbons, Surfactant, Pesticides, Lignin, Tannin, Synthetic dyes, Biotransformation: Oxidation reactions: Cytochrome P450 monooxygenase system, Alcohol and aldehyde dehydrogenases, Peroxidases. Reduction reactions: Cytochrome P450 and flavin dependent reactions. Hydrolysis reactions: Carboxyl esterases. Conjugation reactions: Gluthione S transferases. Regulation of biotransformation.

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## M. Sc. BIOTECHNOLOGY Semester IV (NOTE: Candidates of other M. Sc. Subjects can choose this paper from Biotechnology subject) Paper – IV (Foundation Paper II) Basic rDNA Technology

## UNIT I:

## **History of Gene cloning**

- Boyer-Cohen-Chang experiment. Patenting of the recombinant DNA technique; Berg's role in gene cloning history, Change in medicinal science after discovery of recombinant DNA technology (brief mention of how we produce human insulin today, somatostatin and other therapeutic products, very brief overview of how we may treat diseases through gene therapy)
- Why do we clone genes? (amplification and/or heterologous gene expression). Basic steps of gene cloning:
- Agarose gel electrophoresis; 2D Electrophoresis; Pulsed field gel electrophoresis; SDS PAGE; 16S rDNA sequencing for bacterial identification; ITS region sequencing for fungal identification; RFLP; RAPD

## Unit II:

## Basic process of recombinant DNA technology

- Cutting and joining of DNA. Vectors: concept, types of vectors (plasmids, phage, virus), Essential qualities that a vector must possess
- Types of vectors: pBR322, cosmids, lambda phage

## Unit III:

## Basic process of recombinant DNA technology

• Transformation and Transfection – basic techniques. Selectable markers (antibiotic resistance, lacZ), Selection process, Screening.

## Unit IV:

## **Applications of gene cloning**

• Insulin, Somatostatin, BT Cotton, production of human proteins and drugs, recombinant vaccines, agricultural applications, production of transgenic animals, human gene therapy

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#### M.Sc. Biotechnology (CBCS) Semester-IV (Candidate can opt for this paper in their main subject of postgraduation ONLY). Paper-IV: (Core Subject Centric II) Therapeutic Medical Biotechnology

# Molecular Therapeutics and Drug Discovery

## Unit I

Gene therapy; Intracellular barriers to gene delivery; Overview of inherited and acquired diseases for gene therapy; Retro and adeno virus mediated gene transfer; Liposome and nanoparticles mediated gene delivery. Gene silencing technology; siRNA- Concept, delivery and therapeutic applications in treatment of influenza and HIV/AIDS; Tissue and organ transplantation; Transgenics and their uses; Cloning; Ethical issues
# Unit II

Proteomics and drug discovery: High throughput screening for drug discovery; Identification of drug targets; Pharmacogenomics and pharamacogenetics and drug development; Toxicogenomics; Metagenomics.

### Unit III

Nanobiotechnology for drug discovery, protein and peptide based compounds for cancer and diabetes, drug delivery - nanoparticle based drug delivery, lipid nanoparticles, vaccination, cell therapy, Gene therapy. Ethical, safety and regulatory issues of nanomedicine. Physicochemical characteristics of nanomaterials, Nanoparticle interaction with biological membrane, Neurotoxicology.

### Unit IV

Drug Discovery & Clinical research

Introduction and importance of clinical research, Drug Development and phases of Clinical trials, Designing clinical Trials, Protocol designing, Ethical issues in clinical research, ICH-GCP Guidelines, Informed consent process, Role of CRC and CRA in clinical trials, Pharmacovigilance, Standard operating procedures, Guidelines to undertake clinical trials in India schedule Y.

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Dosing and Health Effects, Informa Healthcare. 2007.

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# M. Sc. BIOTECHNOLOGY

## Semester IV

## LAB I

### Animal Biotechnology, Biostastics, Bioinformatics, Ethics & Patenting And Industrial Biotechnology II or Environmental Biotechnology

## Section I: Animal Biotechnology, Biostastics, Bioinformatics, Ethics & Patenting

1. Development of primary cell lines/maintenance of established cell lines

- 2. Preparation of animal cell culture media.
- 3. Filter sterilization and sterility test.
- 4. Media storage, serum inactivation.
- 5. Cell fusion.
- 6. Cell transformation by viruses.
- 7. Lyophilization of local germplasma.
- 8. Calculation of mean, mode, and median
- 9. Calculation of standard deviation and standard error
- 10. Using computer in single user and multiple user environment
- 11. Designing and management of databases
- 12. Computer aided statistical analysis
- 13. Computer presentation of statistical data, charts and diagrams
- 14. Computer aided visualization of amino acid sequence of protein and its 3D structure.
- 15. Retrieving metabolic pathway using internet
- 16. Homology searching using BLAST
- 17. Base sequence analysis of gene / protein sequence
- 18. Computer aided survey of scientific literature
- 19. Field layout based on statistical research designs
- 20. Determination of rheological constant

### Section II: Section A) Industrial Biotechnology OR Section B) Environmental Biotechnology A) Industrial Biotechnology

- 1. Demonstration of various bioreactor configuration, parts and integrated process control system.
- 2. Demonstration of addition of inoculation and sampling in CSTR
- 3. Determination fo volumetric mass transfer coefficient (KLa) by dynamic method and sulphite oxidation method
- 4. Preparation of wine from grapes.
- 5. Preparation and characterization of immobilized cells system
- 6. To perform cell disruption by ultrasonication
- 7. To study the settling velocity of solid particles under batch sedimentation

# OR

## **B) Environmental Biotechnology**

- 1. Test for the degradation of a aromatic hydrocarbons by bacteria
- 2. Survey of degradative plasmids in microbes growing in polluted environment
- 3. Effect of Sulphur dioxide on crop plants
- 4. Estimation of heavy metals in water/soil by Atomic absorption spectrophotometry,
- 5. Estimation of nitrate in drinking water.
- 6. Role of microorganisms in elevation of heavy metal induced stress in plants.
- 7. Isolation of xenobiotic degrading bacteria by selective enrichment technique
- 8. In vitro evaluation of medicinal plants against pathogenic microbes.
- 9. Effect of mycorrhizal fungi on growth promotion of plants.
- 10. Study of patenting procedure
- 11. Preparation of proposal for patenting.
- 12. Study of RFLP, VNTRs, SNPs

### Note: At least 6 practical must be conducted within the semester.

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#### M. Sc. Part II, Sem IV Seminar

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B.Sc. I Semester-I Paper-I History And Microbial Morphology

Unit-I: History and scope of Microbiology.

i)Discovery of microbeii)Theory of biogenesis and a biogenesis.

iii)Contributions of Louis Pasteur, Robert Koch, Lister Winogradsky and Beijerink, John Tyndal iv)Branches of Microbiology: a] systemic microbiology including bacteriology, mycology, phycology, virology, b] biotechnology, c] geomicrobiology, d] exobiology,e]medical microbiology, f]environmental microbiology Unit-II:Prokaryotic Cell structure I

i)A Typical Bacterial cell structure, ii)Structure of cell wall(-gram +ve, gram-ve)

iii)Cellmembrane:Fluidmosaicmodel,mesosomesiv)Ribosomes,Nucleoid,plasmids, Storage granule Unit- III

i) Capsules, slime layer, Pili, Flagella(including types and structure).

ii) Endospore structure, formation and germinationiii) Exospores, Myxospores, Eukaryotic spores, iv) significance of dormancy Unit IV—Bacterial Taxonomy

i)Significance of classification, ii)Intuitive classification, Whittaker five kingdom system, iii)Bergys manualninthedition, numerical classification, iv)Approaches in modern classification: GC:AT Ratio, DNA Hybridization, 16SrRNA Cataloguining and phylogeny Paper-II-Microbial Diversity.

Unit-I:Prokaryotic microbes

i)Generalcharactersofa)Proteobacteria,b)Mycoplasma,c)Rickettsiaandchlamydia
ii)Cyanobacteria: Study of anabena and applications of cyanobacteria iii)Actinomycetes: Streptomysis and their applications

iv)Archaebacteria: Methanogenic bacteria and their importance Unit-

II:Eukaryotic microbes

i) Fungiandyeast:Generalcharacters,Asexualandsexualmodeofreproduction,slideculture techniques.

ii) Algae:-General characters and industrially important algal cells

iii)Protozoans: General characters and life cycle of trypanosome

iv)Differences between prokaryotes and eukaryotes Unit-III:Acellular microbes:Viruses.

i)Discovery of viruses, General structure, symmetry and classification ii)Cultivation, chick embryo, tissue culture

iii) Detection of viral growth iv)T4-Bacteriophages,lytic cycle, Lysogeny and Lambdaviruses.

Unit-IV:Microbial interaction.

i) Positive and negative interaction: Commensalism, synergism, syntropism, mutualism, parasitism, predation, antagonism, competetion

ii) Protist-Protist Interaction:Bdellovibrio iii)Protist-

Plant interaction: Root nodule bacteria

iv)Protist-Animal interaction: Rumen bacteria, insect midgut bacteria, luminescent bacteria

### Semester-II

Paper-I-Microbial Physiology Unit-I:Microbial Nutrition. i)Nutritional types of bacteria.ii)Basic nutritional requirements.

iii)Types of culture media, growth, selective, enriched, enrichment, synthetic non synthetic. iv)Axenic cultures. Diauxiccultures. Unit-II:Microbial growth and cell cycle.

i)Bacterial cell cycle ii)Principle of growth curve and mathematical expression. iii)Continuous culture: Turbidostat and chemostat.iv) Factors influencing microbial growth.

Unit-III: Microbial control.

i)Concept of microbial death ii)General terms: microbiostatic, cidal disinfectant, sanitizer. iii)Ideal antimicrobial agents.
iv)Physicalmethods;a)Heat and moist sterilization.b)Dry sterilization, c)Low temperature. d)Filtration, e)radiation, f)osmoticpressure.
Unit-IV: Chemical agents

i) Phenolics, Alcohols, Halogens, Heavy metals, Quaternary ammonium compounds, Bignamides-Chlorohexidines, Surface active agents, Aldehydes
b)Gaseous sterilization
c)Chemotherapeutic agents i)Mechanism
of cell injury. ii)Factors influencing
antibiotic activity d)Phenol coefficient
Semester-II

Paper-II-Microbial Techniques

Unit-I:Microscopy-I Principle and application

i)Brightfieldmicroscopy,ii)Darkfieldmicroscopy,iii)ElectronMicroscopy(TEM,SEM), iv)Confocal microscopy. Unit-II: Microscopy- II-Principle and applications

i)Atomic Force Microscopy ii)Phase contrast microscopy.iii)Fluorescent microscopy.

Unit-III- Staining techniques

i) Stainsanddyes, chromophore, auxochrome, chromogens, types of stains.

- ii) Staining techniques : simple, differential, gram staining, acid fast staining.
- iii) Staining of specific structure: flagella, spores, capsule (negative)
- iv) Theory of staining

Unit-IV:Nutritional and growth techniques. i)Isolation of pure culture:various techniques. ii)Determination of CNP etc. by auxeno graphic and replica plate technique iii)Synchronous culture techniques.iv)Measurement of growth B.Sc. II Semester III Paper I

Chemistry of Organic Constituents And Enzymology

Unit I-Carbohydrates And Lipids

Classification of carbohydrates ,Structure of glucose, fructose, maltose, lactose, sucrose, raffinose, starch, hyaluronic acid, glycogen, cellulose, osazone formation Classification of lipids, structure of triglyceride, compound lipids, derived lipids

Unit II---Amino acids and proteins

Classification of amino acids, titration curve, acidic, basic and neutral amino acids, peptide bond theory, organizational levels of proteins, concept of oligomeric protein

UnitIII--- Enzymology

Definitions and nature of enzymes, classification, nomenclature, primary concept of enzyme kinetics, MM equation, modifications of MM equations, activation energy, transition state, ES complex, enzyme activity, katal, specific activity, turn over number Enzyme inhibition and their types, enzyme regulation, their types, allosteric sites, allosteric modulaters, functional diversity such as holoenzyme, apoenzyme, coenzyme, cofactor, prosthetic group, isoenzymes, membrane bound enzymes, multienzyme complex, zymogens

Unit IV---Nucleic acid and Vitamins

Structure of purines, pyrimidines, nucleosides, nucleotides, DNA, RNA, and various forms of DNA Types of vitamins, Classification on the basis of solubility, functions of vitamins, Hyper and hypovitaminosis B.Sc. II Semester III Paper II Industrial Microbiology

Unit I---Fundamentals of industrial microbiology

Definition and scope of industrial microbiology, general concept, primary screening, secondary screening, strain development, sterilization of fermentors, production of media and air Unit II---Fermentor design

Types of fermentation processes, design of typical fermentor, parts of fermentor, factors effecting fermentor design, control of agitation, aeration, pH and dissolved oxygen, types of fermentors Unit III ---scale up and DSP

Inoculum development, scale up of fermentor process, raw media for media preparation, Harvesting and product recovery Unit IV ---Industrial Production

Production, biochemistry, recovery and uses of: SCP, Bakers yeast, ethanol, penicillin, semisynthetic penicillin, citric acid, Vit B12 and beer and wine

B.Sc. II Semester IV Paper I MetabolismUnit I---CarbohydrateGeneral strategy of metabolism, EMP pathway and its regulation, TCA cycle and its regulation,Outline of ED pathway, Pentose Phosphate pathway, PK pathway

Unit II---Lipid and Nucleic Acid

Betaoxidation, Omegaoxidation, Replication of DNA, modes of replication, general features, enzymes involved, rolling circle and knife and fork model, Prokaryotic transcription including general features, enzymes involved and reverse transcription

Unit III---Amino acids and Proteins

Amino acid breakdown, deamination,(alanine, tyrosine, metionone) urea cycle, metabolic breakdown of individual amino acids, glucogenic and ketogenic amino acids Genetic code and Prokaryotic translation

Unit IV---Energy Generation

High energy molecules, substrate level phosphorylation, Cyclic and noncyclic photophosphorylation, Oxidative phosphorylation and ATP generation

B.Sc. II Semester IV Paper II

Applied Microbiology

Unit I ---Water microbiology

Significance of bacteriological analysis of water, collection and handling of water samples, indicators of excretal pollution, bacteriological analysis of water for coliforms and faecal streptococci (MTFT, MFT), water treatment using SSF and RSF,methods of chlorination, differences between fecal and non fecal organisms Unit II---Waste water treatment

Sewage types, composition, physical, chemical and biological characteristics, BOD, COD, ThOD, trickling filter, activated sludge, RBC, sludg digester, oxidation pond, septic tank, imhoff tank Unit III--- Air and Soil microbiology

Microbial analysis of air, settling plate and Anderson technique, bacteria and fungi as biopesticides, biofertilizers, PSB, mycorrhiza, microbial leaching of copper and uranium Unit IV --- Food microbiology

Food spoilage organisms, canning process, pasteurization, low temperature preservation, chemical preservation Food borne diseases and food intoxication B.S c. Final Semester V Paper-I Medical microbiology Unit-I Epidemiology and host –parasite relationship.

a) Definitions:

i) Signs, symptoms and syndrome of disease, stages of infectious diseases-incubation period, prodromal phase, Invasive phase, decline phase and the period of convalescene, primary infection, secondary infection, acute infection, chronic infection local and systemic infection.

ii) Bacteremia, septicaemia, pyamia, toxemia, Viremia.

iii)Epidemic,Endemic,Pandemic,Zoonotic,Exotic. b)Dynamics of disease transmission: i)Causative or etiological agents[list] ii)sources of reservoir of infection.

.Exogenous Human (case and carrier) Non-living reservoir. Endogenous infections. iii)Portal of exit

iv)Mode of transmission-Contact, Vehicle,Vector,Air-borne,transplacental and laboratory/hospital infections.

v) Portal of entry. vi)Susceptibility of host.

c)control of communicable diseases: Control of sources, blocking the channels of transmission,protecting the susceptible host.

### Unit-II

a)Microbial mechanism of Pathogenicity: pathogenicity and virulence, exaltation and attenuation, MID, MLD, ID 50, LD50.

i)Invasiveness:-adherence,capsule,enzymes. ii)Toxigenicity:-Exotoxins and Endotoxins. b)Normal flora of healthy human host:

Definition, origin significance, Germ free and Gnotobiotic life. Characteristics of normal flora..

c)Infectious microbiology: Microbial diseases of skin, eye, digestive,

respiratory, cardiovascular, lymphatic, urinary, reproductive and nervous systems.

(outline of structure of each system and lists of infectious diseases affecting the particular system). Unit-III

Study of pathogenic organisms: Morphology, cultural characteristics, biochemical characteristics, serology, lab diagnosis

1.Bacteria:

.Salmonella typhi and paratyphi A & B.

.Mycobacterium tuberculosis.

.Spirochetes-treponemma pallidum 2.Viruses: .HIV

.Hepatitis A & B 3.Protozoa: .Plasmodium

Unit-IV

Disease control:

Basic principle of drug designing. Development of modern drug delivery system. Basic mechanism of action of drugs. Bacterial cell wall synthesis inhibitor; Penicillin Bacterial protein synthesis inhibitor: chloramphenicol Bacterial DNA synthesis inhibitor: Nalidixic acid, Floxacin antibiotics. Antimetabolites:Trimethoprime,sulfamethoxazole. Non automated and automated in vitro drug susceptibility testing-kirby-Bauer disc diffusion method and e-strip method. Reasons for development of resistance

Semester V Paper-II Molecular biology and bioinstrumentation Unit-I Gene mutation and regulation.

- a) Concept of gene, muton, recon, cistron, monocistronic and polycistronic gene, gene within gene, spit gene.
- b)Gene regulation:lac operon(detail)

c)mutation:Definition,random vs directed mutation,type of mutation,base pair substitution,frame shift,point,nonsense,missense,and

silent mutation.

d) Genetic suppression: Intergenic and Intragenic.

e) Molecular basis of mutation: Mechanism of spontaneous and induced mutation. Unit-II Genetic recombination:

a)Definition,Basic concept of recombination b)General types of recombination. c)Transformation.
d)Conjugation e)Transductions f)Transposable genetic elements(Prokaryotic)
e)Unit-III

Bioinstrumentation-I( Principles and applications)

- a) Spectroscopy:Laws of absorption,limitations of beer law,UV-Visible spectroscopy and its applications.
- b) Centrifugation: Type of centrifuge, analytical and ultra centrifugation, density gradient centrifugation.
- c) Electrophoresis:Principle,types of electrophoresis,agarose gel electrophoresis and SDS-PAGE.

Unit-IV

Bioinstrumentation-II( Principles and applications)

a) Chromatography: Thin layer chromatography, ion exchange, gel filtration, HPLC b) Isotope tracer technique: Method and applications.

Detection and measurement of stable isotope: Mass spectrometry.

Detection and measurement of radioactive isotope: GM counter, scintillation counter B.Sc. Final Semester VI Paper-I

Immunology

Unit-I: Defensive mechanism of host: a)Nonspecific defences of the host: i)species,race and Individual resistance. ii)age,sex,hormonal and nutritional influences. iii)Mechanism of non-specific defences:

I.First line of defence:Skin,mucus membrane,Mechanical chemical and microbial defences. II.Second line of defence:Phagocytosis,inflammation,fever,interferon,complement system. b)Acquired immunity: Active and Passive immunity.

c)Organs involved in immune function:

1. Primary lymphoid organs:Bursa,bone marrow,thymus.

2. Secondary lymphoid organs:Lymph nodes, Spleen,MALT,GALT,CALT. Unit-II: a) Diagram of Haematopoiesis.

b)Cells of immune system: general characters of 1)B and T cells,

2) Monocytes and macrophages, 3)Neutrophils,Eosinophils and basophiles. 4)Mast cells 5)Dendritic cells 6)Natural Killer cells.

c)B-cell biology:(Humoral immunity)

1. Primary and secondary immune response

2. Clonal selection and clonal deletion(immune tolerance) 3.T-cell dependent antibody response. outline

4.T-cell independent antibody response.outline d)T-cell biology:(Cell mediated immunity) 1.Types of T-cells and Cluster of differentiation(CD) 2.T-cell receptor(TCR)

3. Cytotoxic T-cell response

4. MHC molecules and antigen presentation.(diagrammatic)

5. Cytokines-Definition,types(colony stimulating factor,Interleukins,Tumor necrosis factor alpha). Unit-III: a)Antigens:

I)Definition,Complete antigen,hapten,epitope,valence. II)Factors determining antigenicity III) Antigenic mosaic of bacteria

IV)Antigens in relation to human being:Species specific, isoantigen, autoantigen(RA), Organ specific antigens, Heterophile antigens.

b)Antibody: I.Definition,General structure.

- II. Classes of Immunoglobulins and their functions. c)Ag-Abreactions(Diagnostic immunology)
- I. General features of antigen-antibody reactions.
- II. Antibody titre, rising antibody titre, paired sera

- III. Precipitation: Precipitation in liquids, Immunodiffusion, Immunoelectrophoresis.
- IV. Agglutination: Slide agglutination,tube

agglutination, haemagglutination, Haemagglutination inhibition test, coomb's test, passive agglutination.

UNIT IV

- a) Tagged antibody test: ELISA direct and indirect
- b) Immunofluroscence
- c) Hypersensitivity reactions:Definition,Gel & Coomb's classification.
- 1. Type I (Anaphylaxis) Hypersensitivity: Mechanism of anaphylaxis, systemic and localized anaphylaxix, prevention of anaphylaxis.
- 2. Type II (Cytotoxic) Hypersensitivity:

.Blood transfusion reaction(Rh compatibility)

.Heamolytic diseases of the new borne 3.Type III (Immune complex)hypersensitive: .Arthus reaction

.Serum sickness.

4. Type IV(delayed)Hypersensitivity: Mantaux test, allergic contact dermatitis. Semester

VI Paper II Biotechnology Unit I:

Tools & techniques of genetic engineering:

- a) Preparation of pure samples of DNA, range of enzymes used in DNA manipulation, analysis of DNA fragment size, Joining of DNA molecule, vectors and their types.
- b) Introducing rDNA into host cell,transformation of cells,identification of transformed cells,selection of clones,direct and indirect method.
- c) Expression of cloned genes, construction of gene library, cells for cloning, expression of prokaryotic genes.
- d) PCR and its application, DNA fingerprinting. Unit-II: Application of genetic engineering: a) Health Biotechnology:

i)Production of hormones:insulin ii)Production of interferon.

- iii) Production of vaccines:Conventional vaccines:BCG,salk,Diphtheria toxoid,ATS,DNA vaccines,Edible vaccines.
- iv)Hybridoma technology,monoclonal antibody formation Unit-III
- b) Agricultural biotechnology: i)Protoplast fusion ii)Biopesticides. iii)Biofertilizers
- c) Industrial biotechnology

i) Bio sensor and Nano biotechnology applications

ii) Biochips and concept of microarray. d)Ethics and hazards of biotechnology.

Unit-IV Food

- 1) Genetically modified food. definition and one example 2)Oriental Fermented food:soya sauce,miso,sufu 3)Transgenic plants.BT Cotton
- 4) Transgenic animals and clones: Knockout mice, Dollyship, Milching animals

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#### **RTM NAGPUR UNIVERSITY** NAGPUR SEMISTER PATTERN **SYLLABUS** (To be implemented from session <u>2013-14</u>)

### SUBJECT CHEMISTRY B.Sc. –I, Semester - I <u>CH – 101: Paper- I (Inorganic</u> **Chemistry**)

#### Unit-I

(A) Atomic structure-Idea of de-Broglie matter Waves, Heisenberg's uncertainty principle. Schrodinger wave equation, significance of  $\Psi$  and  $\Psi^2$ , Quantum numbers, shapes of s, p, and d orbitals, Aufbau principle, Pauli's exclusion principles and Hund's rule of maximum multiplicity . Electronic Configuration of elements and ions (Z = 1 to 30)

(B) Periodic Properties: Atomic and ionic radii, ionization energy, electron affinity and electronegativity- Definition, trends in periodic table. Factors affecting ionization potential. Pauling's and Muliken's scale of electronegativity. Effective nuclear charge and Slater's rule with some exercises

#### **Unit-II**

#### 5 Hrs)

(A) Covalent Bond: Valency Bond Theory , Formation of Hydrogen molecule, Limitations, directional characteristics of covalent bond, overlap criterion and bond strength. Bond energy, bond length, Bond order, Bond angle. Various types of hybridization and shape of inorganic molecules. Valence shell electron pair repulsion (VSEPR) theory toNH<sub>3</sub>, SF<sub>4</sub>, ClF<sub>3</sub>, and H<sub>2</sub>O (B) Ionic solids: Ionic structures, Lattice energy and Born- Harber cycle. Solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajans rule.

(A) s- block elements-Comparative study: Electronic configuration, atomic and ionic radii, Ionisation potential, Reducing properties. Diagonal Relationships (Li-Mg). Hydrogen bonding .Classification and effect of Hydrogen bonding on viscosity, solubility, M.pt. and B.pt (B)Chemistry of Noble Gases: Chemical properties of the noble gases, Chemistry of Xenon, Structure and bonding in xenon fluorides and oxyfluorides (XeOF<sub>2</sub> and XeOF<sub>4</sub>)

#### **Unit-IV**

#### 5 Hrs)

(A) p-block elements - Comparative study of groups 13 to 17: Atomic and ionic radii, Ionisation potential, electronaffinity, electronegativity, redox properties, oxidation state. Diagonal relationship (B-Si).

(7.5 Hrs)

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(B) Hydrides :Comparative study with respect to structure of  $NH_3$ ,  $PH_3$ ,  $AsH_3$  and  $SbH_3$ . Oxides: Structure of  $P_2O_3$ ,  $P_2O_5$  and Oxyacids of Phosphorous ( $H_3PO_3$  and  $H_3PO_4$ ) Peroxyacids of sulphur: Preparation and structure of Caro's and Marshall's acids. Hydrides of boron: Structure and bonding of diborane , structure of borazine .

### <u>CH – 102 : Paper- II ( Physical Chemistry)</u>

#### Unit-I

#### .5 Hrs)

#### **Gaseous State**

A) Postulates of kinetic theory of gases, derivation of kinetic gas equation, deduction of various gas laws from kinetic gas equation. Qualitative discussion of the Maxwell- Boltzmann distribution of molecular velocities. Effect of temperature on molecular velocities. Different types of molecular velocities (most probable, R.M.S. and average and expressions for them, their inter relationships. Definitions of Mean free path collision diameter and collision number.

(**B**) Ideal gas and real gases, behavior of real gases, deviations from ideal behavior, explanation of the terms

- Compressibility factors and Boyle temperature. Causes of deviation from ideal behaviors. Vander Wall's equation of state, explanation of behaviour of real gases. Critical phenomenon (P-V isotherms of real gases). The isotherms of Van der Wall's equation, Relationship between critical constants and Van der Wall's equation, Relationship between critical constants and Van der Wall's equation, Relationship between critical constants and Van der Wall's equation, Relationship between critical constants.

#### **Solid State**

Laws of crystallography

Unit-II (7.5Hrs)

- i) Law of constancy of interfacial angles
- ii) Law of rationality of indices
- iii) Law of symmetry, symmetry elements in crystals.

Unit cell, space lattice, orientation of lattice place (Miller indices).Bravais lattices, crystal systems, X-ray diffraction by crystal, derivation of Braggs' equation. Determination of crystal structure of NaCl, KCI and CsCl Laue's method and powder method.

#### Liquid State

- A) Intermolecular forces, structure of liquids (a qualitative description), structural differences between solids, liquids and gases, liquid crystals, Classification, structure of Nematic and Cholesteric phases, Thermographic and seven segment cell.
- **B**) Properties of liquid :

i) Surface tension : Explanation, methods of determination, Capillary rise method and drop number method, Parachor value and its application .

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ii) Viscosity : Explanation, coefficient of viscosity, Effect of temperature on Viscosity, relative viscosity, specific viscosity and intrinsic viscosity and reduced viscosity. Method of determination by Ostwald viscometer.

iii) Refractive index : specific refraction, molar refractions and chemical constitution. Method of determination by Abbe's Retractometer.

### Unit- IV

### Surface Chemistry and Catalysis-

Hrs)

**A)** Adsorption- General introduction, Factors affecting adsorption of Gases by Solids, Types of adsorption, Adsorption Isotherms :Freundlich Adsorption Isotherm, Langmuir Adsorption Isotherm,

B.E.T. Equation(no derivation), Application of B.E.T. Equation in Determination of Surface Area of Adsorbent, , Effect of Dissolve substance on Surface Tension of the solvent ( Adsorption at the Surfaces of Solutions ), Application of Adsorption.

**B)** Catalysis:- Introduction, Homogeneous & Heterogeneous Catalysis Examples , Action of Catalytic Promoters & Inhibitors, enzyme catalysis, auto catalysis ,Kinetics of Enzyme Catalysed Reactions- Machaelis-Menten Equation

### CH-103: Laboratory

# **<u>Course</u>** Practical- I(Inorganic Chemistry): Semi micro

### **Qualitative Analysis**

Qualitative analysis of inorganic salt mixture containing two acidic radicals of different group and two basic radicals of same groups. (<u>At least six mixtures to be analysed</u>)

### **Practical- II (Physical Chemistry)**

- 1) Determination of relative viscosity of unknown liquid by Ostwald viscometer.
- 2) To determine the percentage composition of given binary mixture (Ethanol-water) by viscosity method.
- 3) 'Determination of surface tension of a given liquid by drop number method (Stalagmometer method)
- 4) Comparison of cleaning action of surfactants.
- 5) Determination of refractive index of given liquid by Abbe's refractometer.
- 6) Construction of various crystal models of NaCl unit cell.
- 7) To verify the Freundlich & Langmuir's adsorption isotherm of acetic acid on charcoal.

## B.Sc. –I , Semester - II

### <u>CH – 201: Paper- I (Organic Chemistry)</u> Unit - I

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### 5 Hrs)

A) **Structure and Bonding :** Hybridization in case of Methane, Ethane, Ethylene and Acetylene, Bond lengths, bond angles and bond energies. Elementary ideas of Inductive effect, Electromeric effect. Resonance effect,Hyperconjugation (definition and examples). Hydrogen bonding in organic compounds (with reference to alcohol) and its consequences.

**B)** Mechanism of Organic Reactions : Homolytic & heterolytic bond fission with examples . Electrophiles & nucleophiles definition and example both neutral and charged.Types of organic reactions addition, substitution, elimination, rearrangement. Reactive intermediates carbocations,

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carbaions, free radicals, carbenes, formation, geometry, stability.

#### Unit - II

#### .5 Hrs)

**Stereochemistry of Organic Compounds :** Concept of isomerism. Types of isomerism with suitable examples. Optical isomerism-elements of symmetry, molecular chirality, enantiomers, stereogenic centre(lactic acid as example). Optical activity, chiral and achiral molecules with two stereogenic centres (Tartaric acid) diastereo-isomers, mesocompound. Resolution of enantiomers biological and chemical methods. Inversion retention and recemisation. Asymmetric synthesis. Relative and absolute configuration, sequence rules, D & L and R & S system of nomenclature. **Geometrical isomerism :** E & Z system of nomenclature, geometric isomerism in maleic acid and fumaric acid and 2-butene.

**Conformational isomerism :** Conformational analysis of ethane and n-butane.

Newman's projection and sawhorse formulae. Difference between configuration and conformation.

# Unit - III

Hrs

A) Alkanes: IUPAC nomenclature of branched and unbranched alkanes. Alkyl group, methods of formation (Ethane) - Wurtz reaction, Kolbe's reaction, decarboxylation of carboxylic acid. Physical properties and chemical reactions of alkanes: halogenation, nitration, sulphonation, isomerization, cyclization, aromatization, pyrolysis and cracking oxidation, L. P. G., Octane number. Mechanism of free radical chlorination of methane.

**Cycloalkanes :** Nomenclature, Baeyer's strain theory and its limitations. Ring strain in small rings cyclopropane and cyclobutane. Theory of stainless rings. Conformational analysis of cyclohexane, axial and equatorial bonds.

B) Alkenes : Nomenclature of alkenes, methods of formation (ethylene & propylene) - dehydrogenation, dehydrohalogenation of alkyl halides, dehydration of alcohol dehalogenation of dihalides.Chemical reactions of alkenes (ethylene and propylene) - hydroboration, oxidation KMnO<sub>4</sub>, HIO<sub>4</sub>, Epoxidation, Ozonolysis, Hydroxylation, Polymerization Substitution in allylic position of alkenes. Markownikoff's Rule and peroxide effect. Ionic Mechanism of addition of Br<sub>2</sub> to ethene and HBr to propene Free radical mechanism of addition of HBr to propene.

### Unit - IV

### .5 Hrs

- A) Dienes: Nomenclature and classification of dienes Methods of formation of 1, 3 butadiene. Chemical reactions of butadiene - 1, 2 and 1, 4 additions Diels-Alder reaction.
   Alkynes:Nomenclature, structure and bonding in Alkynes. Methods of formation of acetylene from - calcium carbide, dehydrohalogenation of dihalides Chemical reaction - hydroboration, oxidation metal ammonia reduction & polymerization. Oxyacetylene flame. Acidity of alkynes.
- **B**) Aromatic compounds and Aromaticity: Nomenclature of Benzene derivatives, structure of benzene, Molecular formula and Kekule structure. Resonance structure, MO picture, Huckel rule, aromatic ions (cyclopentadienyl anion and cycloheptatrienyl cation). Aromatic electrophillic substitution mechanism with energy profile diagram (eg. nitration and sulphonation).

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### CH - 202: Paper- II ( Physical Chemistry)

### **UNIT-I : Thermodynamics**

#### 5 Hrs

- (A) Recapitulation of thermodynamic terms : system, surrounding, types of system (closed, open & isolated), Thermodynamic, variables, intensive & extensive properties, thermodynamic processes isothermal, adiabatic, isobaric, isochoric, cyclic, reversible & irreversible. State function & path functions, concept of heat & work.
- (B) Statements of first law of thermodynamics, definition of internal energy & enthalpy, heat capacity, heat capacity at constant volume and at constant pressure, their relationship. Joule-Thomson experiment, Joule-Thomson coefficient & inversion temperature, calculations of w, q  $\Delta E \& \Delta H$  for expansion of gases for isothermal & adiabatic conditions for reversible process,.

Thermo chemistry : Heat of reaction ,relation between heat of reaction at constant volume and constant pressure. Hess's law of constant heat of summation & its applications. Average bond energy ,bond dissociation energy and its calculations from thermochemical data,

#### **UNIT-II : Phase Equilibra**

#### 5 Hrs

- (A) Phase rule : Statement of phase rule, definition of phase, component and degree of freedom, Applications of phase rule to one component system i) water system, ii) Sulphur system. Need of reduced phase rule equation. Two component system (Pb-Ag system) ,Pattinson,s process.
- (B) Liquid-Liquid mixtures : Ideal liquid mixtures, Raoults law of ideal solutions, Henry's law, nonideal systems, azeotropes : HCl-H<sub>2</sub>O & ethanol- water system. Partial miscible liquids : phenolwater system, trimethylamine-water, nicotine-water system, lower & upper consolute temperature, effect of impurity on consolute temperature , Nernst distribution law, limitations and applications(association and dissociation).

#### **UNIT-III : Electrochemistry**

#### 5 Hrs

- A) Electrical transport : Conductance in metals (electronic) & in electrolyte solutions (ionic conductance), conductivity of electrodes, specific, equivalent and molar conductance, measurement of equivalent conductance, variation of equivalent & specific conductance with dilution, mobility of ions & Kohlrausch's law, Arrhenius theory of electrolyte dissociation & its limitation, Debye-Huckel theory (elementary treatment).Relaxation effect, Electrophoretic effect and Onsagar equation.
- B) Migration of ions, velocity of ions & change in concentration around electrode, transport number : definition & determination by Hittorfs method & moving boundary method, factors affecting transport number of ions, relation between transport number & ionic conductance. Application of Kohlrausch's law & conductance for the determination of degree of dissociation, dissociation constant of acids, solubility of sparingly soluble salt, conductometric titrations (Acid-base & precipitation titrations).

# **UNIT-IV: Chemical Kinetics**

#### Hrs

(A) Concept of reaction rate, factors affecting the rate of a reaction – concentration., temperature, pressure, solvent, light, catalyst. Order and molecularity, Zero order. Mathematical expression for rate constant of first and second order reactions, their characteristics. Pseudo order reactions. Half life and mean life of reactions with examples. Methods of determination of order of reaction –

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integration method, differential method, graphical method, method of half life period and isolation method. Effect of temperature on rate of reaction. Arrhenius equation, concepts of activation energy.

(B) Collision theory of bimolecular reactions (hard sphere model). Transition state theory, expression for rate constant based on equilibrium constant and thermodynamic aspects. Lindmann's theory of unimolecular reactions

### CH-203: Laboratory Course

### Practical I (Organic Chemistry):

A) Qualitative Analysis: Element detection(N, Cl, Br, F & S),Identification of functional groups (-COOH, Phenolic –OH,\_-CHO, Aromatic -NH<sub>2</sub>, -CONH<sub>2</sub>),determination of M.P & B.P.

B) Preparation: i) Hydrolysis : Preparation of Benzoic acid from Benzamide

ii) Oxidation: Preparation of Benzoic acid from Benzaldehyde

iii) Bromination of Phenol

### Practical II(Physical Chemistry):

1 To determine the heat of solution of potassium nitrate calorimetrically.

2 To determine the heat of ionization of acetic acid calorimetrically

3 To determine the solubility of benzoic acid at different temperatures and to determine heat of solution of benzoic acid.

4 To construct the phase diagram of three component system(Acetic acid-chloroform-water)

5. To determine the critical solution temperature of two partially miscible liquids(phenol-water systems).

6 To study the distribution of Iodine between Water and Carbon tetrachloride/Kerosene

7. To determine the strength of the given acid (HCL or CH<sub>3</sub>COOH) conductometrically using standard alkali solution.

8. To determine the specific reaction rate of the hydrolysis of methyl acetate catalyzed by  $H^+$  ions at room temperature.

**9**.To dertermine the specific reaction rate of hydrolysis of ethyl acetate catalysed by base (saponification)

## B.Sc. -II, Semester - III

## <u>CH – 301:Paper- I (Inorganic Chemistry)</u>

### Unit – I

### 5 Hrs

(A) **MO theory** :LCAO approximation, wave equation for molecular orbitals. Difference between bonding and anti bonding MO in terms of energy and electron density distribution curves, order of energy levels in MO. Molecular Orbital diagrams for homonuclear diatomic molecules of elements(with Z=1

to 9) Concepts of nonbonding MO in HF molecule. Coulson's MO diagram of CO and NO diatomic molecule.

(**B**).Preparation ,properties and structure of tetrasulphur tetranitride  $(S_4N_4)$  and Interhalogen compounds.

Poly halides(Structure of  $I_3$ ,  $I_5$ , and  $ICl_4$ ).

#### Unit-II:

### 5 Hrs

#### A) Chemistry of elements of first transition series:

Characteristic properties of the elements of first transition series with reference to their: Electronic configuration, Atomic and ionic radii, Ionization potential, Variable oxidation states, Magnetic properties, Colour, Complex formation tendency and catalytic activity.

#### **B)** Non-aqueous solvents:

Classification of solvents and characteristic reactions( acid base, redox & precipitation reactions) in Non- aqueous solvents with reference to i)Liquid Ammonia and ii) Liquid Sulphur dioxide.

#### Unit – III:

#### 5 Hrs

#### A) Chemistry of elements of second and third transition series:

Electronic configuration of 4d and 5d transition series .Comparative treatment with their 3danalogous (Group Cr-Mo-W, Co-Rh-Ir,) in respect of oxidation states and magnetic behavior.

#### **B)** Errors in Chemical Analysis:

i) Random and Systematic errors, Explanation of terms: Accuracy and Precision, Uncertainty, Absolute and Relative errors, Mean , Median, Average and Standard deviations, Significant figures, numerical problems.

ii) Statistical Test of Data: Q-test, 2.5d and 4d Rules for rejection of data. Numerical problems

#### Unit – IV:

#### 5 Hrs

#### A) Chemistry of Lanthanides:

Position in periodic table , electronic configuration, Oxidation states, Atomic and ionic radii, Lanthanide contraction and its consequences, Complex forming tendency. Occurrence and separation of lanthanides (ion exchange and solvent extraction).

#### **B)** Chemistry of Actinides:

Position in periodic table, electronic configuration, Oxidation states, Atomic and ionic radii.

#### CH-302 : Paper- II (Organic Chemistry)

#### Unit –I 7.5 Hrs

**Orientation :** Activating  $(-OH, -NH_2)$  & deactivating  $(-Cl, -NO_2, -COOH)$  substituent's, their orientation and directive influence on further electrophilic substitution, o/p ratio. Methods of formation and chemical reactions of alkyl benzene (Toluene) and biphenyl.

Alkyl halides : Nomenclature, classification, methods of formation, chemical reactions.

Mechanism of nucleophilic substitution reactions of alkyl halides S  $^1$  and S  $^2$  with energy profile diagrams.

**Polyhalogen compounds :** Chloroform and carbon tetrachloride – formation and chemical reactions. **Nuclear and side chain halogen derivatives of benzene (Aryl halides) :** Chlorobenzene and benzyl chloride preparation and reactions. Relative reactivity of alkyl halides vs aryl halides. Synthesis and uses of DDT and BHC.

#### Unit – II

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### 5 Hrs

A) Alcohols : Classification and nomenclature,

**Dihydric alcohols :** Nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage (pb(Oac)<sub>4</sub> and HIO<sub>4</sub>) and Pinacol – pinacolone rearrangement.

**Trihydric alcohols :** Nomenclature and methods of formation, chemical reactions of glycerol. (C) **Phenols :** Nomenclature, structure and bonding, Preparation of phenols From cumene,

chlorobenzene

( Dows and Raschig process) and diazonium salts. Physical properties and acidic character, Resonance stabilization of phenoxide ion, Reactions of phenols, Electrophilic aromatic substitution, acetylation and carboxylation, Claisen rearrangement, Gatterman synthesis reaction Mechanism of i) Fries Rearrangement, ii) Reimer-Tiemann reaction.

## Unit – III

#### Hrs

Aldehydes and ketones : Nomenclature and structure of the carbonyl group, synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides and ketones from nitriles. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensation, Wittig reaction, Mannich reaction, oxidation of aldehydes(by KMnO<sub>4</sub>,Tollens reagent and Fehlings solution), Baeyer-Villiger oxidation of Ketones, Cannizaro reaction, (with mechanism) MPV, Clemmensen, Wolf-Kishner, LiAlH<sub>4</sub> and

NaBH<sub>4</sub> reductions,

Unit IV

### .5 Hrs

A) Carboxylic Acids : Nomenclature, structure & bonding, Physical properties, acidity of carboxylic acids, effect of substituent's on acid strengths preparation of carboxylic acids(from G.R. and cyanides), Reactions of carboxylic acids, Hell-Volhard-Zelinsky reactions. Reduction of carboxylic acids, Mechanism of decarboxylation. Methods of formation and chemical reactions of unsaturated monocarboxylic acids (crotonic acid and cinnamic acid).

**Dicarboxylic acids :** Methods of formation and effect of heat and dehydrating agents. ( Succinic acid, Phthalic acid).

(B) Carboxylic acid derivatives : Structure & nomenclature of acid chlorides, esters, amides and acid anhydrides. Interconversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, Chemical reactions, Mechanism of esterification and hydrolysis (acidic and basic).

### CH- 303: Laboratory Course

#### Practical-I (Inorganic Chemistry):

### Volumetric Analysis (All 5 Expts. to be performed)

Preparation of standard solution by weighing is compulsory

- 1) Estimation of Fe(II) by dichromate using internal indicator.
- 2) Determination of acetic acid in commercial vinegar using NaOH
- 3) Determination of alkali content in antacid tablet using HCl
- 4) Determination of Zn by complexometric titration with EDTA
- 5) Determination of total Hardness of water (permanent and Temporary ) by EDTA

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#### Practical- II(Organic Chemistry):

Complete analysis of simple organic compound involving following steps :-

(i) Preliminary examination ii)Detection of elements iii)Detection of functional group iv)Determination of M.P. /

B.P. v) Preparation of derivative and its M.P./B.P. vi)Performance of specific test if any

### B.Sc. –II , Semester – IV

#### <u>CH – 401:Paper- I (Inorganic Chemistry)</u>

#### Unit-I:

#### Hrs

#### **Coordination compounds:**

Distinction among simple salts , double salts and coordination compounds. Werner's Coordination theory and its experimental verification. Sidgwicks electronic interpretation, EAN rule with examples, Nomenclature of Coordination compounds. Chelates: Classification and their application, Valence Bond Theory of transition metal complexes.

#### Unit-II:

#### 5 Hrs

#### A) Isomerism in coordination compounds:

Structural isomerism and Stereoisomerism in coordination compounds.

#### **B)** Oxidation and reduction:

Use of redox potential data: Analysis of Redox cycle, redox stability in water, Latimer diagram of Chlorine and Oxygen, Frost diagram of Nitrogen and Oxygen, and Porbaix diagrams of Iron.

#### Unit-III:

#### 5 Hrs

### A) Organometallic Chemistry

Definition, Nomenclature and Classification of Organometallic compounds .Preparation properties and application of Alkyl and Aryls of Li and Al. A brief account of metal ethylenic complexes (Structure only).Homogeneous Hydrogenation (Wilkinson's Catalyst reaction).

**B)** Metal carbonyls-Definition, preparation, properties, structure and bonding in mononuclear carbonyls- Ni(CO)<sub>4</sub>, Fe(CO)<sub>5</sub> and Cr(CO)<sub>6</sub>

### Unit –IV :

Hrs

A) **Bioinorganic Chemistry**: Essential and Trace elements in biological processes, Metalloporphyrins with special reference to structure and role of Hemoglobin and Myoglobin in transport of Oxygen. Biological role of Na<sup>+</sup> and K<sup>+</sup> and Ca<sup>2+</sup> metal ions.

**B)** Hard and Soft Acids and Bases: Classification of Acids and Bases as Hard and Soft. Pearson's HSAB Concept and its applications.Symbiosis.

### <u>CH – 402:Paper- II ( Physical Chemistry)</u>

**UNIT-I ; Thermodynamics** 

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#### Hrs

(A) Second law of thermodynamics : Need for second law of thermodynamics, statements of second law of thermodynamics, Carnot's cycle and its efficiency, thermodynamic scale of temperature, concept of entropy, entropy as a state function of V & T, P & T, entropy change in phase change for ideal gas, entropy as criteria of spontaneity & equilibrium.

(B)Free energy functions: Helmholtz free energy (A) & Gibb's free energy (G) and their properties, standard free energies, effect of temperature on free energy (Gibb's – Helmholtz equation) & its applications, A & G as criteria for thermodynamic equilibrium.

(C) Systems of variable composition: Partial molar quantities, chemical potential, Van't-Hoffs reaction isotherm, relation between standard free energy change & equilibrium constant (thermodynamic derivation of law of mass action), effect of temperature on equilibrium constant

(reaction isochore).

# UNIT -II : Electrochemistry

### Hrs

(A) Galvanic cells, irreversible & reversible cells, emf of cells & its measurement, calculation of thermodynamic quantities of a cell reactions ( $\Delta$ G,  $\Delta$ H &  $\Delta$ S & equilibrium constant)

(B) Types of reversible electrodes : gas electrode, metal-metal ion electrode, amalgam electrode, metal insoluble salt-anion, redox electrodes, Half cell reactions, Nerns't equation, calculation of cell emf from single electrode potential, reference electrodes, standard electrode potential, concentration cells with & without transference, liquid-junction potential, salt bridge & its functions, Applications of emf measurements in : (i) pH<sup>-</sup> determination using hydrogen electrode, quinhydrone electrode & glass electrode (ii) potentiometric titration(Acid –Base and Redox titrations).

# Unit-III

### Hrs

A)\_Nuclear chemistry : Composition of Nucleus, Mass defects, nuclear binding energy, Average binding energy per nucleon, explanation of nuclear stability on the basis of graph between average binding energy per nucleon and atomic mass number. Nuclear reactions : Fission and fusion. Nuclear models : Liquid drop model, Shell model and comparison between them. Explanation of fission by liquid drop model. Applications of radioisotopes in medicine, agriculture, carbon dating and structure determination

### **B)** Dipole moment

Electrical dipole moment, polarizatrion of molecules (Clasius Mosotti equation), orientation of dipoles in an electric field. Determination of dipole moment. Bond moments. Group moments for benzene derivatives. Application of dipole moment to (i) % ionic character (ii) Shape of molecules, (iii) study of geometrical isomers and (iv) substituted benzene molecules.

# **Unit IV : Spectroscopy**

## Hrs

## A)Rotational Spectroscopy :

Introduction to spectroscopy, Dipole moment and Rotational Spectra. Rotational spectra of diatomic molecules, Energy levels of rigid rotor. Selection rule for transition between energy levels. Expression for wave number (cm<sup>-1</sup>) of spectral lines in terms of rotational constant (B) and rotational quantum number (J). Intensity of spectral lines. Application of rotational spectra for determination of bond length of diatomic molecules. Introduction to non-rigid rotor.

## **B) Vibrational Spectra** :

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Energy levels of simple harmonic oscillator, Energy level diagram, relative populations of energy levels. Selection rule for pure vibrational spectra (harmonic oscillations), Force constant. Anharmonic oscillator,

Morse equation, selection rules, idea of overtones. Degrees of freedom and normal modes of vibration for polyatomic molecules. Idea of vibrational frequencies of different functional groups.

### CH-403: Laboratory Course

#### Practical-I (Inorganic Chemistry):

### A) Gravimetric Analysis

- i) Estimation of Ba<sup>2+</sup> as BaSO<sub>4</sub>,
- ii) Estimation Ni<sup>2+</sup> as Ni-DMG
- **B**) **Chromatographic separation** of binary mixtures(at least Two) containing Cu(II), Co(II) and Ni(II) ions by paper chromatography and determination of Rf values.

### Practical-II ( Physical Chemistry):

- 1. To determine the strength of strong acid and a week acid in a given mixture conductometrically by titrating it with standard alkali solution.
- 2. To determine the solubility and solubility product of a sparingly soluble salt conductometrically.
- 3. To determine the ionization constant of weak acid conductometrically.
- 4. To titrate potentiometrically ferrous ammonium sulphate solution using potassium dichromate solution as titrate and calculate the redox potential of  $Fe^{2+}/Fe^{3+}$  system on hydrogen scale.
- 5. To determine the dissociation constant of weak acid potentiometrically by titrating it against alkali.
- 6. To determine heat of solution of solid calcium chloride and calculate lattice energy of calcium chloride from its enthalpy change data using Born-Harber cycle.
- 7 .To determine the strength of given acid (HCL or CH<sub>3</sub>COOH) potentiometrically using standard alkali solution
- 8. To determine the molecular state of Benzoic Acid by distribution method .

### B.Sc. –III, Semester – V

#### CH- 501:Paper- I (Organic Chemistry)

### UNIT- I

#### 5 Hrs

**Organic compounds of Nitrogen :** Preparation of nitroalkanes and nitrobenzene, chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitrobenzene and their reduction in acidic, neutral and alkaline media. Picric acid- preparation and uses,

**Amines :** Structure and nomenclature of amines, Physical properties, stereochemistry of amines, separation of mixture of  $1^{\circ}$ ,  $2^{\circ}$  and  $3^{\circ}$  amines, structural features affecting basicity of amines, preparation of alkyl & aryl amines (reduction of nitro compounds and nitriles), reductive amination of aldehydic and ketonic compounds, Gabriel phthalimide reaction, Hofmann bromamide reaction, Reactions of amines, Preparation and synthetic transformations of aryl diazonium salts.

#### UNIT – II

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### 5 Hrs

### **HETEROCYCLIC COMPOUNDS :**

Molecular orbital picture and aromaticity of furan, thiophene, pyrrole and pyridine. Methods of synthesis of pyridine. Mechanism of electrophilic and nucleophilic substitution reaction of pyridine. Chemical reaction of pyridine. Structure of pyridine. Comparison of basicity of pyrrole and pyridine. Introduction to condensed five and six membered heterocycles. Preparation and reactions of Indole, Quinoline and Isoquinoline with special reference to Fischer Indole synthesis, Skraup synthesis and Bischler Napieralski synthesis.

### UNIT-III

### Hrs

A) Quantitative Analysis : Estimation of carbon, hydrogen, nitrogen, sulphur and halogens (only principles and calculations). Calculation of Empirical and molecular formula with Numericals

### **B)** Organometallic compounds :

Organomagnesium compound : Grignard reagent formation, chemical reactions and structure. Organozinc compounds : Formation and chemical reactions. Organolithium compounds: Formation and chemical reactions.

### UNIT-IV

### **SPECTROSCOPY** :

- A) Electromagnetic spectrum : Absorption spectra, Ultraviolet absorption spectroscopy, Absorption laws( Beer Lambert law), molar absorptivity, Presentation and analysis of UV spectra, Types of electronic transitions, Effect of conjugation, concept of chromophores and auxochromes, Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated dienes and enones.
- B) **Infrared (IR) absorption spectroscopy :** Molecular vibrations, Hook's law, Selection rules, Intensity and position of IR bands, measurement of IR spectrum. Fingerprint region, characteristic absorptions of various functional groups and application of IR spectra.

### CH- 502:Paper- II ( Physical Chemistry)

### Unit I : Quantum Chemistry I Hrs

- A)Failure of classical mechanics : Explanation on the basis of Black body radiation, Photoelectric effect, heat capacity of solids and Bohr's model of Hydrogen atom (No derivation) . Plank's quantum theory. De Broglie's hypothesis (Derivation and experimental proof). Heisenberg's uncertainty principle (Explanation and experimental proof).
- **B**) Introduction to wave functions  $(\Psi)$ , well behaved wave functions. Interpretation of wave function  $(\Psi)$  and its square  $(\Psi^2)$ . Schrodinger wave equation. Normalized and orthogonal wave functions (only qualitative idea no problems). Introduction to operators. Postulates of quantum mechanics, Derivation of Schrodinger wave equation from postulates of quantum mechanics. Partical in a one dimensional box : derivation of energy and normalized wave function. Graphical representation of  $\Psi$  and its square  $\Psi^2$ . Applications of particle in a one dimensional box. Numerical problems.

### Unit II :

Hrs

A) **Quantum Chemistry** Schrodinger wave equation for hydrogen atom, separation in to three equations (without derivation, in terms of r,  $\Box$  and  $\Phi$ ), Total wave function for hydrogen atom in terms of radial and angular wave functions, energy of hydrogen atom (no derivation). Hydrogen

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like wave functions, radial wave functions and angular wave functions. Interpretation of quantum, numbers. Concept of orbital and radial probability distribution curves for 1s, 2s, 2p, 3p and 3d orbitals.

B) **Molecular orbital theory :** Criteria for forming M. O. from A. O., LCAO-MO method for  $H_2^+$  molecule, expression for energy levels for bonding and antibonding wave functions. Normalized wave functions for bonding and antibonding (no derivation). Physical pictures of bonding and antibonding wave functions. Introduction to M. O. theory for  $H_2$  molecule (Qualitative treatment, without derivation). Introduction to Valance bond theory for  $H_2$  molecule.

### Unit III

Hrs

### A) Solutions and Colligative properties

Methods of expressing concentration of solutions, Raoults law of relative lowering of vapour pressure, molecular mass determination from relative lowering of vapour pressure. Osmosis, osmotic pressure and its measurement by Barkeley and Hartley method.Determination of molecular mass from osmotic pressure. Elevation of boiling point, determination of molecular mass from elevation of boiling point. Depression of freezing point. Determination of molecular mass from depression of freezing point. Van't Hoff factor, degree of dissociation and association of solute.

### **B)** Magnetic properties :

Electron spin angular momentum, spin quantum number, electron as magnetic dipole, magnetic moment of electron, Bohr magneton, relation between magnetic moment and number of unpaired electrons. Magnetic properties of substances. Diamagnetism, paramagnetism, ferromagnetism, determination of magnetic susceptibility using Gouy method. Determination of magnetic moment of paramagnetic substances. Applications of magnetic susceptibility measurements.

#### Unit IV

#### Hrs

#### A) Photochemistry :

Interaction of radiation with matter, difference between thermal and photochemical process, Beer – Lamberts, laws of photochemistry : Grothus-Draper law, Stark-Einstein law, Jablonski diagram depicting various processes (nonradiative and radiative) fluorescence, phosphorescence, chemiluminesence, quantum yield, determination of quantum yield of reactions, causes for low and high quantum yields. Some examples of photochemical reactions (e.g. Photochemical decomposition of Hydrogen iodide, Photosynthesis of HBr from  $H_2$  and  $Br_2$  and photosynthesis of HCI from  $H_2$  and  $Cl_2$  Photosensitized reactions. Energy transfer processes.

#### **B) Raman Spectroscopy :**

Raman effect, Concept of polarizability, Pure rotational Raman spectra of diatomic molecules. Applications of rotational spectra.

#### CH-503: Laboratory Course

### **Practical I (Organic Chemistry):**

Estimations i) Estimation of Glucose

ii) Estimation of Amide

iii) Estimation of Nitro group

iv) Estimation of Carboxylic group

v) Saponification of oil

#### Practical II (Physical Chemistry):

7.5

1.To verify law of refraction for mixture (glycerol-water) using Abbe's refracto meter. 2.To determine the specific rotation of a given optically active compound.

- 3. To verify Beer-Lambert law for KMnO<sub>4</sub> and determine the concentration of the given solution of KMnO<sub>4</sub>.
- 4. To determine molecular mass of a non-volatile solute by Rast method.
- 5. To determine the molecular weight of polymer by Viscometric method.
- 6. To determine the surface tension of methyl alcohol, ethyl alcohol & n-hexane at room temperature & also calculate atomic parachors of carbon, hydrogen & oxygen.
- 7. To determine the energy of activation of reaction between persulphate iodide .
- 8. To study the rate of acid catalysed iodination of acetone.

# B.Sc. –III, Semester – VI

# <u>CH – 601: Paper- I (Inorganic Chemistry)</u>

### Unit- I

# A)Metal ligand bonding in Transition Metal Complexes:

**7.5 Hrs** Limitations of Valency bond theory, Crystal field theory: Splitting of d-orbital in octahedral,tetrahedral and square planar complexes. Factors affecting the Magnitude of 10Dq,Crystal field Stabilisatation Energy of Octahedral and Tetrahedral complexes (Numericals )

### **B)** Electronic spectra of Transition Metal Complexes:

Jahn Teller Effect, Selection Rules (Laporte and Spin selection Rules). Hole Formalism Principle. Electronic spectrum of  $[Ti(H_2O)_6]_{3+}$  and  $[Cu(H_2O)_6]_{2+}$  complex ions

### Unit-II

## A)Magnetic Properties of Transition Metal Complexes:

**7.5 Hrs** Method of determining of Magnetic Susceptibility by Gouy's Method. Spin only formula and orbital contribution to magnetic moment. Magnetic properties of Octahedral and Tetrahedral complexes with respect to CFT. Numericals on magnetic moments

# B) Thermodynamic and Kinetic aspect of metal complexes:

Thermodynamic and Kinetic stability of metal complexes, their relation. Stepwise stability and overall stability constant and their relationship, Factors affecting the Stability of complexes. Determination of composition of Fe(III)-SSA complex by Mole Ratio and Job's Method.

## Unit –III

## A) Colorimetery and Spectrophotometery:

**7.5 Hrs** Principles of photometery:Beer-Lamberts Law,derivation and deviation(Numericals). Types of colorimeter and spectrophotometer with simple schematic diagrams. Application of colorimeter and spectrophotometer in quantitative analysis with reference to estimation of Cu(II) as Cuammonia complex.

### **B) Separation Techniques:**

a) Chromatography: Classification, Principle, Technique and Application of Paper and Column Chromatography.

b) Ion- Exchange: Types of ion exchange resins, Equilibria and ion exchange capacity, Application in separation of binary mixtures.

c) Solvent Extraction: Principle and Classification , Factors influencing extraction and application in chemistry  $% \left( {{\left[ {{{\left[ {{{\left[ {{{c_{1}}} \right]}}} \right]}_{i}}} \right]_{i}}} \right)$ 

### **Unit- IV Inorganic Polymers:**

#### 5 Hrs

Silicones: Introduction, Nomenclature, preparation, properties and uses, General introduction to Silicon oils, Silicone Elastomers and Silicon Resins

Phosphonitrilic halide polymers : Introduction, Preparation, properties and uses. Structure and bonding in (NPCl<sub>2</sub>)<sub>3</sub> and (NPCl<sub>2</sub>)<sub>4</sub>,

#### CH- 602: Paper- II (Organic Chemistry)

### UNIT-I: NMR

Hrs

Nuclear Magnetic Resonance (NMR) spectroscopy. Proton Magnetic Resonance spectroscopy. Nuclearshielding and deshielding, Chemical shift, Spin-spin splitting and Coupling constant. Areas of signals. Interpretation of NMR spectra of organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,2 dibromoethane, ethyl acetate, toluene, acetophenone, acetyl acetone. Problem

pertaining to the structure elucidation of simple organic molecules by NMR technique.

### **UNIT-II**

#### Hrs

### **A) ORGANIC SYNTHESIS VIA ENOLATES :**

Acidity of  $\Box$ -hydrogens, Reactivity of methylene group. Malonic ester preparation and reaction-Acetoacetic ester - synthesis by Claisen condensation reactions, Keto - enol tautomerism of acetoacetic ester, Preparation of acetic acid, succinic acid, crotonic acid and heterocyclic compounds

C) CARBOHYDRATES : Definition, classification and reaction of glucose. Mechanism of osazone formation. Determination of structure of glucose. Determination of ring size of monosaccharides. Epimerisation, mutarotation, conversion of glucose into fructose and vice-versa. Chain lengthening and shortening of aldoses(Wohl's degradation). Introduction to structures of maltose, sucrose, lactose, starch, cellulose, ribose and deoxyribose without involving structure determination.

### UNIT-III

#### Hrs

### A) AMINO ACIDS, PEPTIDES, PROTEINS & NUCLEIC ACIDS :

Classification, structure and stereochemistry of amino acids. Acids base behavior, isoelectric point and electrophoresis. Structure and nomenclature of peptides and protein. Classification of proteins. Protein denaturation. Structure determination of proteins (primary and secondary).

NUCLEIC ACIDS: Introduction, constituents of nucleic acids. Ribonucleosides and Ribonucleotides. Double helical structure of DNA.

B) FATS, OILS AND DETERGENTS : Natural fats, edible and industrial oils of vegetable origin, Glycerides, hydrogenation of unsaturated oils, Definition of Saponification value. Iodine value. Acid value, Soaps,

Synthetic detergents, Alkyl and aryl sulfonates.

# **UNIT-IV**

Hrs

A) SYNTHETIC DYES : Colour and constitution (Witt theory, electronic concept) Classification of

7.

7.5

7.5

132

Dyes based on chemical constitution.Synthesis and uses of Congored, Crystal violet, Phenolphthalein and Alizarin dye.

- **B) SYNTHETIC DRUGS:** Definition,Classification,Preparation ,properties and uses of :Aspirin, Paracetamol,Dettol,Chloroquine,Phenobarbitone,Chloramphenicol, ,Chloramine T.
- C) **SYNTHETIC POLYMERS :** Addition or chain growth polymerisation, free radical. Vinyl polymerisation, Ionic vinyl polymerisation, Ziegler Natta polymerisation .Condensation or step growth polymerisation. Polyesters, polyamides,

### CH-603: Laboratory Course

### Practical-I (Inorganic Chemistry):

A) Preparation of following complexes and Comments on its VBT structure, magnetic properties and colors

a)  $[Cu(NH_3)_4(H_2O)_2]SO_4$  b)  $[Ni(NH_3)_6]SO_4$  c) Trans  $[Co(NH_3)_4Cl_2]Cl$  d)  $K_3[Fe(C_2O_4)_3].H_2O$ 

- **B**) Colorimetery
  - i) Colorimetric or spectrophotometric estimation of copper (II) in commercial copper sulphate sample as ammonia complex.
  - ii) Jobs method of determination of composition of Fe- SSA complex
  - iii) Mole Ratio Method of determination of composition of Fe- SSA complex

### Practical-II (Organic Chemistry):

Separation of an organic mixture containing two solid components using NaOH /NaHCO<sub>3</sub> for separation , identification of the components and preparation of suitable derivatives (minimum five mixtures)

## PHYSICS (B. Sc. Part- I)

Semester I (Paper-101, 102,

103)

Semester II (Paper-201, 202, 203)

(2013-2014)

### B. Sc. First Year (Semester I) Course-PHYSICS–Paper-I(101) (Properties of Matter and Mechanics)

### Marks-50

### Time- 30hours

### Unit I:

**Elasticity**- Introduction, Hooke's law, Elastic constants  $(Y, K, \eta)$  and relation between them, Poisson's ratio, Elastic limit, Work done in stretching a wire, Bending of beam, Bending moment, External and internal bending moment, Cantilever supported at one end and at both end, Torsional pendulum, and Maxwell needle.

### Unit II:

**Viscosity**- Streamline and turbulent flow, Coefficient of viscosity, Equation of continuity, Euler's equation, Bernoulli's theorem and its applications (Lift of an Airplane, Atomizer), Poiseuilli's formula, Reynolds number, Terminal velocity, Stokes law by the method of dimension, Variation of viscosity with temperature.

#### Unit III:

**Surface tension**- Introduction, Angle of contact and wetting, Surface energy, Surface tension by Jaeger's, Quincke's and Capillary risemethods.

**Mechanics**- Newton's law of motion, motion in a plane, components of velocity and acceleration in different coordinate system, Centripetal acceleration, Coriolis force and its applications.

### Unit IV:

**Mechanics**- System of particles, Center of mass, Equation of motion, Conservation of linear and angular momentum, Conservation of energy, Single stage and multistage rockets, Elastic and inelastic collisions, Moments of inertia and their products, Moment of inertia of cylinder and sphere, Principal moments and axes.

#### **References & Text books-**

- 1. Applied Fluid Mechanics, by- Mott Robert, Pearson Benjamin Cummir, VI Edition, Pearson Education/Prentice Hall International, New Delhi
- 2. Properties of Matter, by- D. S. Mathur, Shamlal Chritable Trust New Delhi
- 3. Properties of matter, by-Brijlal
- 4. Physics for Degree Students B.Sc.-Part-I, by-C.L. Arora, Dr. P.S. Hemne, S Chand & Company.
- 5. General Properties of matter, by- J. C. Upadhyay, Ram Prasad & Sons
- 6. Mechanics, by- D. S. Mathur, S Chand.
- 7. Mechanics, by-B. M. Roy, Das Ganu Publications.
- 8. Mechanics & Electrodynamics, by- Brijlal & Subramaniam.
- 9. A text book of properties of Matter, by- N. S. Khare& S. Kumar.
- 10. Mechanics & Properties of Matter, by-J. C. Upadhyaya.

## B.Sc. First Year (Semester I) Course -

### PHYSICS - Paper-II (102)

### (Electrostatics, Time varying fields & Electric Currents)

#### Marks-50

#### Time- 30 hours

#### Unit I:

**Electrostatics-** Coulombs law in vacuum in vector form, Force between two charges, Electric field intensity, Electric potential, Electric field intensity due to a point charge, Electric dipole, Electric dipole moment, Electric field intensity due to an electric dipole, Electric field as a negative gradient of potential, Conservative nature of the electric field.

#### Unit II:

**Dielectric-** Introduction, definition of polar and non polar molecules, Polarization of charges in a dielectric, Clausius - Mossitti equation, Three electric vectors D, E and P and relation between them,

Concept of capacitance, Parallel plate capacitor without and with dielectric, application of Gauss's law to parallel plate capacitor.

## Unit III:

**Time varying fields**-Electromagnetic induction, Faradays laws in differential and integral form, Lenz's law, self and mutual induction, Transformer, Construction, working and its parameters, Energy losses.**Electric Currents**- Current density, Equation of continuity, Kirchhoff's law, Rise and decay of current in LR and CR circuits, Decay of charge in LCR circuits.

### Unit IV:

Electric Currents- Application of complex number in solving an a. c. circuit, j- operator method,

A.C. applied to pure resistive, pure inductive and pure capacitive circuit, application of j- operator in LR, CR and LCR circuit, Resonance, Sharpness of resonance, Series resonance circuit (Calculate I, Z,  $\Phi$  and fr),Q factor, Power in an a. c. circuit, Power factor.

### **References and Text books -**

- 1. Electricity and Magnetism, by- Brijlal, Subramanyam.
- 2. Fundamental of Magnetism and Electricity, by- D. N. Vasudiva.
- 3. Electricity and Magnetism with Electronics, by- K. K. Tiwari.
- 4. Electricity and Magnetism, by K.K. Tiwari.
- 5. Elements of Electronics, by- M. K. Bagde, S. P. Singh, K Singh S Chand.
- 6. Solid State Physics and Electronics, by- R. K. Puri, and V. K. Babbar.
- 7. Solid state Electronic Devices II Edition, by-B. G. Strretman.
- 8. Introduction to Electrodynamics, by- D. J. Griffiths.
- 9. Electromagnetic fields, by- T. V. S. Arun Murthy.
- 10. Electronics Fundamental and Applications II nd Edition, by-J. D. Ryder.

### B.Sc. First Year (Semester I) Course -

#### **Physics Practical (103)**

- 1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of university practical examination in 6 hours.
- 2. The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 Ma	rks each) - 18 Marks Record
book	-06 Marks
Viva Voce	-06 Marks
Total	30 Marks

List of the experiments-

- 1. Range and least count of Instruments, measurements using various instruments and error analysis (vernier caliper, screw gauge, traveling microscope, spectrometer etc.)
- 2. Young's modulus by cantilever.
- 3. Young's modulus by bending of beam.
- 4. Young's modulus by vibrational method.
- 5. Modulus of rigidity by Torsional pendulum.
- 6. Modulus of rigidity by Maxwell's needle.
- 7. Determination of  $\eta$  by statical method.
- 8. To determine Coefficient of Viscosity of water by Poiseulle's method.
- 9. Surface tension of a liquid by Quincke's method.
- 10. Surface tension of a liquid by Jagers method.
- 11. Surface tension of a liquid by Capillary rise method.
- 12. To determine the moment of inertia of a body using torsion pendulum.

13. To determine the moment of inertia of a fly-wheel.

14. Measurement of Inductance by phasor diagram method.

15. Measurement of Capacitance by phasor diagram method.

16. To study charging and discharging of a condenser through a resistor R.

17. To study growth/decay of current in LR circuit.

18. Study of growth of current in CR Circuit using microammeter.

19. Frequency of A.C. Mains by sonometer.

20. Study of frequency response of series LCR circuit and determination of Q- factor.

21. Study of Transformer (parameters determination).

22. Verification of Kirchhoff's law, using electrical network.

**23.** To calculate low resistance by potentiometer.

24. Calibration of an ammeter by potentiometer.

25. Determination of dielectric constant of a solid.

# B. Sc. First Year (Semester II) Course – PHYSICS - Paper-I (201)

# (Oscillations, Kinetic theory of gases and Thermodynamics)

Marks-50

Time- 30 hours

Unit I:

**Free oscillations-** Introduction to linear and angular S.H.M., Differential equation of S.H.M. and its solution, Composition of two perpendicular linear S.H.M.s for 1:1 and 1:2 (analytical method), Lissajous's figure. **Damped oscillations-** Differential equation of damped harmonic oscillator and its solution, Energy equation of damped oscillations, Power dissipation and quality factor.

### Unit II:

**Forced oscillations**- Forced oscillation with one degree of freedom, Differential equation of forced oscillation and its solution, Resonance (Amplitude), Sharpness of resonance, Power dissipation, Quality factor and bandwidth.

**Kinetic theory of gases** -Assumptions, Boyle's law, Equipartition of energy, Molecular collision, Mean free path and collision cross section, Estimate of molecular diameter and mean free path. **Unit III:** 

**Transport phenomenon in gases**- Transport of mass, momentum, energy and their relationship, dependence on temperature and pressure, Van der wall's gas (Real gas, Equation of state), Critical constants. **Thermodynamic** -Thermodynamic variables, Thermal equilibrium and temperature, Zeroth law of thermodynamics, Thermodynamic processes (Reversible and Irreversible), Indicator diagram, First law of thermodynamics, Carnot's cycle and it's efficiency, Carnot's theorem.

## Unit IV:

**Thermodynamic**-Entropy, Second law of thermodynamic, Thermodynamic scales of temperature, Third law of thermodynamics, Maxwell general relationship[ $\delta(T,S)/\delta(x, y) = \delta(P,V)/\delta(x, y)$ ] and it's applications, Joules coefficient, Porous plug experiment, Liquefaction of gases- Boyle's temperature and inversion temperature, Liquefaction of Helium, Air conditioning (Concept only).

## **References and Text books -**

- 1. Waves and Oscillations, by-Stephenson.
- 2. A Text Book of Oscillations, waves and Acoustic, by- Dr. M. Ghosh, Dr. D. Bhattacharya.
- 3. Oscillation, waves and sound, by- Sharma and Saxena.
- 4. Waves and oscillation, by- N. Subrahmanuam and Brijlal.
- 5. The Physics of waves and oscillation, by-N. K. Bajaj, Tata McGraw-Hill, publishing co. ltd.
- 6. Heat, Thermodynamics and Statistical Physics, by-Pragati Prakashan, Singhal, Agrawal.
- 7. Heat and Thermodynamics, by- Brijlal, Subramanyam.
- 8. A Text Book of Heat, by- J. B. Rajam.

9. Heat, thermodynamics and statistical physics, by- Brijlal, Subramayam and Hemne.

10. Heat and thermodynamics, by- C. L. Arora.

11. Treatise on heat, by- Shah, Srivastava.

### B.Sc.FirstYear(SemesterII) Course-PHYSICS - Paper-II (202) (Gravitation, Astrophysics, Magnetism and Magneto statics)

### Marks-50

#### Time- 30hours

### Unit I:

**Gravitation**- Kepler's laws of Planetary motion (statement only), Newton's law of gravitation, Relation between G and g, Gravitational field, Gravitational potential, Gauss's theorem, Gravitational potential and intensity due to uniform solid sphere at a point inside and outside the sphere, Gravitational self energy of a galaxy.

# Unit II:

Astrophysics- The constituents of universe (Solar system, Stars, Galaxies), Introductory study of solar systems, To measure size of a planet (d=D. $\alpha$ ), To measure distance of a planet by parallax method (D=b/ $\theta$ ), Mass of the sun and the planets( M=4 $\pi^2 r^3/GT^2$ ), Structure of sun, Solar interior, surface temperature of sun (T=[R/r]<sup>1/2</sup> .[S/ $\sigma$ ]<sup>1/4</sup>), Solar luminosity, Stellar spectra, The Milky way (shape, size, clusters), Cosmological theories of the universe (Concept only).

## Unit III:

**Magnetism**- Introduction, Magnetic materials, Langevin's theory of diamagnetism, its application as superconductor, Critical magnetic field and Meissner effect, Langevin's theory of para magnetism, Ferromagnetism, Ferromagnetic domain, Curie temperature, Ferrimagnetisms, Ferrites and its applications, Antiferromagnetism, Neel temperature.

## Unit IV:

**Magneto statics**- Concept of magnetic field, Lorentz force equation, Magnetic dipole moment, angular momentum and gyro magnetic ratio, Biot- Saverts law, It's applications (B due to steady current in a long straight wire, B along the axis of circular coil), Ampere's law, It's applications(B for a solenoid, A Toroid), Magnetization current, Magnetic vectors, Gauss law of magnetization.

# **References and Text books -**

- 1. Modern's abc of physics, Vol. II, by- Satish K. Gupta. (For Astro Physics, Unit 13).
- 2. The Great Universe, by- G. K. Sasidharan, S Chand publications.
- 3. University physics, by- H. D. Young, R. A. Freedman.
- 4. Astronomy structure of the universe, by- A. E. Roy, D. Clarke, Adam Hilger Pub.
- 5. Electricity and Magnetism, by- D. C. Tayal
- 6. Electricity and Magnetism, by- Rakshit, Chottopadhay

- 7. Electricity and Magnetism, by-S. S. Atwood.
- 8. Electricity and Magnetism, by- K. K. Tiwari.
- 9. University physics, by-I. J. C. Upadhayay, Himalaya publications.
- 10. Foundation of Electrodynamics, by- Theory, Rietz and Millford.

### B. Sc. First Year (Semester II) Course -

#### **Physics Practical (203)**

- 1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of university practical examination in 6 hours.
- 2. The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 Mark	s each) - 18 Marks Record
book	-06 Marks
Viva Voce	-06 Marks
Total	30 Marks

List of the experiments-

- 1. Acceleration due to gravity by compound pendulum.
- 2. To study damping of a bar pendulum.
- 3. To study oscillations of a rubber band and to draw potential energy curve for it.
- 4. To study the oscillation in a bifilar suspension arrangement.
- 5. To determine acceleration due to gravity by Kater's reversible pendulum.
- 6. Study of Lissajous's figure
- 7. To determine the pressure coefficient of air by constant volume air thermometer.
- 8. To verify the Stefan's law of radiation by using an incandescent lamp.
- 9. Thermal conductivity of a metal rod using Forbes method.
- 10. Thermal conductivity of a bad conductor by Lee's disc method.
- 11. To determine the critical temperature and critical pressure of a gas.
- 12. To determine the coefficient of thermal conductivity of glass in the form of a tube.
- 13. To determine specific heat of a given liquid by method of cooling.
- 14. To find Y ratio of specific heat of gas by Clamert and Desormi's method.
- 15. Mechanical equivalent of heat by Calender- Barne's constant flow method.
- 16. To determine the mechanical equivalent of heat (J) with the help of Joule's calorimeter.
- 17. To determine temperature coefficient of resistance of platinum using platinum resistance thermometer
- 18. Study of heating efficiency of electrical kettle with varying voltages.
- 19. To study the variation of total thermal radiation with temperature using the torch bulb filament.
- 20. To determine height of a building, altitude of sun and angular diameter of sun with the help of a sextant.
- 21. To determine the horizontal component of Earth's magnetic field and magnetic moment of the magnet.
- 22. To study the variation of magnetic field along the axis of a current carrying circular coil.
- 23. Study of magnetic field by vibration magnetometer.
- 24. To determine the dipole moment of a given liquid.
- 25. To determine magnetic susceptibility of FeCl3.

## PHYSICS

### (B. Sc. Part- II)

Semester III (Paper-301, 302,

#### Semester IV (Paper-401, 402,

403)

## (2014-2015)

### Unit I:

# B. Sc. Second Year (Semester III) Course-PHYSICS - Paper-I (301) (Sound waves, Applied acoustic, Ultrasonic and Power supply)

Marks- 50

### Time- 30 hours

**Waves in media**- Speed of transverse wave on a string, Group velocity and phase velocity and their relation and measurement, Standing waves, Harmonics, Quality of sound, Human ear and its response (Diagrammatic introduction only), Limit of human audibility, Intensity and loudness, bel and decibel, the musical scale, Temperaments and musical instruments.

### Unit II:

**Applied acoustic**- Transducers and their characteristics (Crystal microphone, Moving coil loud speaker), Recording and reproduction of sound (Magnetic tape, Cine film, Compact disc), Acoustic of building, Reverberation and reverberation period, Sabine's formula, Factors affecting the acoustics of building, Requirements for good acoustics.

### Unit III:

**Ultrasonic**- Introduction, Properties and production of ultrasonic waves, piezoelectric effect, piezoelectric generator, Magnetostriction effect and oscillators, Frequency of ultrasonic waves, Application of ultrasonic waves (measurement of depth of sea, SONAR system and Medical science). **Unit IV:** 

**Power supply**-Introduction, rectification using half wave and full wave rectifiers (Find Id.c., Vd.c., Irms,  $\eta$  and ripple factor), Working of Full wave bridge rectifier, Filters, Difference between regulated and unregulated power supply, line and load regulation, voltage stabilization, Zener diode as voltage regulator, IC voltage regulation.

## References and Text books -

- 1. A Text Book of sound, by- Khanna , Bedi
- 2. A Text Book of sound, by- L. P. Sharma, Saxena (S. Chand)
- 3. Properties of Matter and Acoustics, by- R. Murugeshan, Kiruthign Sivaprakash.
- 4. Fundamental of Acoustics 4<sup>th</sup> Edition, by-Kinsler, John Wiley and Sons.
- 5. Basic Acoustics, by- D. E. Hall, Oxford University Press.
- 6. A Text Book of Oscillations, Waves and Acoustics, by-Dr. M. Ghosh, Dr. D. Bhattacharya (S. Chand)
- 7. Oscillation, Waves and Sound, by- Sharma and Saxena.
- 8. Science and Technology of Ultrasonics, by- Baldevraj, Narosa.
- 9. Elements of Electronics, by- M. K. Bagde, S. P. Singh, K Singh S- Chand.
- 10. Solid State Physics and Electronics, by- R. K. Puri, and V. K. Babbar.
- 11. Solid State Electronic Devices II Edition, by- B. G. Strretman

### B. Sc. Second Year (Semester III) Course-

### PHYSICS - Paper-II (302)

### (Physical optics and Electromagnetic waves)

Marks-50

### Time- 30 hours

## Unit I:

**Interference of light**- Introduction, Interference in equal thickness thin film, Phase change on reflection, refraction and transmitted system. Newton's ring and its application to determine the wavelength and refractive index, Michelson Interferometer and its application to wavelength determination and
wavelength difference, Fabry- Parrot Interferometer and its application.

# Unit II:

**Diffraction of light**- Introduction, Fresnel's diffraction- Half period zones, Zone plates, Diffraction due to straight edge and due to narrow slit.

Fraunhoffer diffraction-Fraunhoffer diffraction at a single slit, at circular aperture, Plane diffraction grating and its application, Resolving power of grating, Rayleigh's criterion for resolution.

# Unit III:

**Polarization**- Introduction, Brewster's law, Polarization by scattering (concept only), Blue color of the sky(only idea), Uniaxial and biaxial crystal, positive and negative crystal, ordinary and extraordinary rays, Nicol prism, its application as an analyzer and polarizer, Double refraction in uniaxial crystal, phase retardation plate (Half and Quarter wave), Double prism.

# Unit IV:

**EM Waves-** Introduction to EM spectrum related to wavelength, origin and characteristics of EM waves, Physical significance of Maxwell's equations, EM wave equations (in conducting medium and in free space), It's transverse nature, Plane polarized EM wave (E0/H0= $^{/}$ ), Characteristics impedance of dielectric, Poynting vector, Poynting theorem.

# **References and Text books -**

- 1. Physics for Degree students for B. Sc. Second year, by- C. L. Arora, Dr. P. S. Hemne.
- 2. Optics and Spectroscopy, by- R. Murugeshan, Kiruthign Sivaprakash.
- 3. Optics, by- Brijlal and Subramayam.
- 4. Optics, by- Ajay Agatak.
- 5. A text book of optics, by- Dr. Subrahmanyam, Brijlal and M. N. Avadhanulu.
- 6. Optics, by- J. K. Sharma, K. K. Sarkar.
- 7. Fundamentals of optics, by-Jenkins and white.
- 8. Optics, by- D. P. Khandelwal.
- 9. Electromagnetic field and waves, by- Paul Lorrain and Dale R. Corson.
- 10. Foundation of Electromagnetic theory, by- John R. Retitz, Fredrick, J. Milford.
- 11. Electromagnetic, by- B. B. Laud.
- 12. Electrodynamics, by- Jordon

# B. Sc. Second Year (Semester III) Course -Physics Practical (303)

- 1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of university practical examination in 6 hours.
- 2. The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 Marks each) - 18 Marks Recordbook-06 MarksViva Voce-06 MarksTotal30 Marks

List of the experiments-

- 1. Study the speed of waves on stretched string.
- 2. Determination of velocity of sound using volume resonator.
- 3. To determine frequency of A. C. Mains with a Sonometer using single/two magnetic wire.
- 4. To determine unknown frequency and to verify the law of inverse variation of frequency and volume of air by Helmholtz resonator.
- 5. To determine the velocity of sound wave in air (gas) with Kundt's tube.
- 6. To determine the radius of curvature of the lower surface of a plano-convex lens by using

Newton's ring apparatus.

- 7. Study of wavelength of light using Newton's ring.
- 8. To study the variation of the fine width with color of light.
- 9. To study the characteristics of micro phone.
- 10. Study of loudspeaker (woofer, squawker, tweeter) as a transducer.
- 11. Study of Piezoelectric effect.
- 12. To Study the current regulation and ripple factor of half wave / full wave rectifier using semiconductor diodes with L and  $\Pi$  type filter.
- 13. To study the characteristics of zener diode.
- 14. To study the zener diode voltage regulating characteristics.
- 15. To study the regulation characteristics of zener regulated and IC 741 regulated power supply.
- 16. To determine the velocity of ultrasonic waves in a given liquid.
- 17. To produce interference pattern using Lloyd's mirror and to determine the wavelength of sodium light.
- 18. To determine the dispersive power of a prism.
- 19. Study of polarization of light by reflection (Brewster's law).
- 20. To find R.I. of glass by using Brewster's law.
- 21. To determine the resolving power of a grating.
- 22. To study diffraction at straight edge and to determine the wavelength of monochromatic light.
- 23. To determine the resolving power of a telescope.
- 24. Study of wavelength of light using plane diffraction grating.
- 25. To determine the wavelength of prominent lines of mercury by plane transmission grating.

#### B. Sc. Second Year (Semester IV) Course-PHYSICS - Paper-I (401) (Solid state physics, X-ray and Laser)

#### Marks-50

#### Time- 30 hours

#### Unit I:

**Solid state physics**- Introduction, Crystal structure, periodicity, lattices and basis, fundamental translation vector, unit cell and primitive cell, Miller indices, allowed rotations, lattice types, lattice planes, Bravais lattices, packing fraction, coordination number, Inter-planer distances, Crystal structures-Na Cl, diamond, CsCl, ZnS etc.

#### Unit II:

**X-ray**-Introduction, discrete and continuous X-ray spectra, Main feature of continuous X-ray spectra, Characteristics X-ray spectra, Duane-Hunt law, X- ray emission spectra, Moseley law its importance and applications, Auger effect, X-ray absorption spectra, applications of X-rays in various fields.

# Unit III:

**Solid state physics**- Reciprocal lattice, Wigner Seitz cell, Geometrical relation between direct and reciprocal lattice, Laue's theory of X-ray diffraction, Bragg's law and Bragg's diffraction conditions in direct and reciprocal lattice, Laue's pattern, Bragg's spectrometer and its applications (wavelength determination and simple cubic structure determination).

#### Unit IV:

**Laser-** Introduction to Laser (purity of spectral line, spatial and temporal coherence), Einstein's relation, absorption, spontaneous and stimulated emission, Population inversion, Optical pumping, characteristics of laser beam, three level and four level laser system, Ruby laser, He-Ne laser, Semiconductor laser, Application of lasers.

#### References and Text books -

1. Solid State Physics, by- S. U. Pillai.

- 2. Cryptography Applied to SSP, by- O. N. Shrivastave
- 3. Solid State Physics, by- Gupta Kumar.
- 4. Introduction to Solid State Physics, by- C. Kettel.
- 5. Modern Physics, by- R. Mugadesham
- 6. Modern Physics, by- J. B. Rajam
- 7. Modern Physics, by- Kumar, Krishane, Nandeem
- 8. A Text Book of Modern Physics, by- K. C. Lal, S. T. Ahmad.
- 9. Modern Physics, by- Aurther Biser.
- 10. Lasers and Non linear optics. By- B. B. Laud
- 11. LASERS- Theory and Applications, by- Thyagarajan and A. K. Ghatak
- 12. Optics and LASER, by- V. K. Sewane
- 13. Introduction to Lasers, by- Dr. Avadhanulu, Dr. P. S. Hemne.

B. Sc. Second Year (Semester IV) Course-

#### PHYSICS - Paper-II (402)

(Solid state electronics, and Molecular physics)

Marks-50

Time- 30 hours

#### Unit I:

**Solid state electronics**- Light emitting diode, Solar Cell, Photovoltaic cell, **Bipolar transistor**-Construction and working, transistor characteristics in CE and CB Mode, Graphical analysis of CE configuration. Hybrid parameters, Equivalent circuit at low frequency in CE mode, Thermal Runaway, Stabilization, Heat sink, Stability factor, Bias stabilizing circuits.

#### Unit II:

**Field Effect Transistor**- Construction, and working principal of JFET, Difference between BJT and JFET, Characteristics of JFET, Parameters, JFET as an amplifier (input and output impedance, voltage gain), Advantage of JFET over BJT. **MOSFET**- Types of MOSFET, Construction and working of MOSFET, Characteristics of MOSFET, Special features of MOSFET.

#### Unit III:

**Molecular physics**- Quantization of vibrational and rotational energies, types of molecules based on moment of inertia, rigid diatomic molecules, Intensity distribution in rotational levels, Diatomic molecules as harmonic and anharmonic oscillator, Rotational-vibrational spectra, Born Oppenheimer approximation.

#### Unit IV:

**Raman spectroscopy**- Raman effect, Classical and quantum explanation, Experimental set up, Raman spectra and molecular structure, Applications of Raman effect, Electronic spectra, Dissociation energy, Frank-Condon principle, Elementary ideas of NMR and ESR and their applications in spectroscopy.

#### **References and Text books -**

- 1. Elements of Electronics, by- M. K. Bagde, S. P. Singh, K Singh S- Chand.
- 2. Solid State Electronic Devices II Edition, by- B. G. Strretman
- 3. Electronics Fundamentals and Applications II Edition, by- J. D. Ryder
- 4. Principals of Electronics, by- V. K. Mehta, Rohit Mehta.
- 5. Basic Electronics (Solid State) by- B. C. Theraja.
- 6. Atomic and Molecular Physics, by- ULP publications, Prof. C. Mande.
- 7. Elements of Spectroscopy, by- Pragati prakashan, Gupts kumar Sharma.
- 8. Optics and Spectroscopy, by- R. Murugeshan and Kiruthiga Sivaprakash, S Chand publication.
- 9. Advanced Molecular Physics, by- Shriram and Sharma.

B. Sc. Second Year (Semester IV) Course -Physics Practical (403)

- 1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of university practical examination in 6 hours.
- 2. The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 M	arks each) - 18 Marks Record
book	-06 Marks
Viva Voce	-06 Marks
Total	30 Marks

List of the experiments-

- 1. To determine wavelength of LASER beam using plane diffraction grating or cylindrical obstacle.
- 2. To study the divergence of a LASER beam.
- 3. To study LASER as a monochromatic coherent source.
- 4. Study of total internal reflection using LASER.
- 5. Measurement of the focal length of a given convex lens using LASER.
- 6. Goniometric study of crystal faces using models.
- 7. To construct SC, BCC, FCC and to find packing fraction, coordination number.
- 8. To determine lattice parameter 'a' of a unit cell of a cubic crystal using X-ray diffraction film.
- 9. To determine the energy gap of a semiconductor using four probe method.
- 10. To determine energy gap of a semiconductor using PN junction diode in reverse bias mode.
- 11. To determine the dielectric constant of a solid and its polarisability by resonance method.
- 12. Study of IR Spectra of HCl molecule.
- 13. Identification of unknown element from line emission spectra.
- 14. To determine the Rydberg constant for Hydrogen.
- 15. Study of characteristics of LED.
- 16. To study the characteristics of photo diode and use as light sensor (LDR).
- 17. Study of Solar cell as a Photo voltaic cell.
- 18. Study of characteristics of transistor in common base mode.
- 19. Study of characteristics of transistor in common emitter mode.
- 20. To study the variation of gain with frequency of single stage common emitter amplifier.
- 21. To study the frequency response of a single stage transformer coupled transistor amplifier.
- 22. To study variation of gain of CE amplifier with load at fixed frequency.
- 23. Study of characteristics of field effect transistor.
- 24. Study of FET as an amplifier.
- 25. To determine the Hybrid parameters of a transistor.

#### PHYSICS (B. Sc. Part- III)

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Semester V (Paper-501, 502,
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503)

Semester VI (Paper-601, 602,

603)

(2015-2016)

#### B. Sc. Final Year (Semester V) Course-PHYSICS-Paper-I(501) (Atomic physics, free electron theory and Statistical physics)

Marks-50

Time- 30 hours

Unit I:

**Atomic physics**- Introduction (Revision of Bohr's model, Somerfield and Chadwick), Vector atom model, Stern-Gerlach experiment, Spinning of electron, Space quantization, Selection rules, Quantum numbers, L-S and J-J Coupling, Pauli's exclusion principal, Hunds rule, Zeeman effect, Normal Zeeman effect, Anomalous Zeeman effect, Stark effect.

#### Unit II:

**Free electron theory**- Drude Lorentz model, Mean free path, Electrical and thermal conductivity, Wiedemann Franz law (Derivation), Density of states, Fermi energy, Fermi temperature. **Band theory of solids**- Bloch theorem (statement only), Kroning Penny model, Concept of hole, Hall effect, Energy bands in solid, distinction between metal, semiconductor and insulator.

#### Unit III:

**Statistical physics**-  $\mu$ - space, Gamma space, probability distribution, thermodynamic probability, Principle of a priori probability, Boltzmann's entropy relation, accessible and inaccessible estates, macro and micro states, Maxwell- Boltzmann distribution law, its application to molecular speed, distinction between mean, r. m. s. and most probable speed values.

#### Unit IV:

**Statistical physics**- Bose-Einstein statistics, its application to black body radiation, Planck's radiation law, Estimation of temperature of sun, Bose- Einstein condensation.Fermi-Dirac distribution and its application to free electrons in a metal, concept of negative temperature, Fermi level and Fermi temperature, comparison between M-B, B-E and F-D statistics.

#### References and Text books -

- 1. Atomic and Molecular Physics, by- ULP publications, Prof. C. Mande.
- 2. Introduction of Atomic Physics, by-White
- 3. Atomic and Nuclear Physics, by- T. A. Littlefield, N. Thorley
- 4. Atomic and Nuclear Physics, by- S. N. Ghoshal.
- 5. Atomic Physics (Modern Physics), by- S. N. Ghoshal.
- 6. Atomic Physics, by- J. B. Rajam.
- 7. Solid state physics, by-R. K. Puri, V. K. Babbar, S Chand.
- 8. Atomic and Nuclear Physics, by- N. Subramanyam, Brijlal.
- 9. Statistical Mechanics, by- Kamal Singh

- 10. Quantum Mechanics ,Statistical Mechanics and Solid state physics, by- Chattopadhyay and P. C. Rakshit
- 11. Heat, Thermodynamics and Statistical Physics, by-Pragati Prakashan, Singhal, Agrawal.
- 12. Fundamental of Statistical Mechanics, by- B. B. Laud, New Age International publications.

#### B.Sc.Final Year (Semester V) Course-

#### PHYSICS - Paper-II (502)

#### (Quantum mechanics, Nanomaterials and Nanotechnology)

#### Marks-50

#### Time- 30 hours

#### Unit I:

**Quantum mechanics**- Failure of classical physics to explain black body spectra, Planck's radiation law, Compton Effect, Wave particle duality, de Broglie's hypothesis, Concept of wave and group velocity, Experimental demonstration of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle and Thought experiment.

#### Unit II:

**Quantum mechanics**- Schrodinger's equation (Time dependent and time independent equations), Physical significance of wave function  $\Psi$ , Operators, Expectation values of a dynamical quantities, Ehrenfest's theorem, Eigen value and Eigen functions, Particle in a box, Application to free particle in a one and three dimension.

#### Unit III:

**Nanomaterials**-Introduction to Nanoscience and Nanotechnology, Difference between nanomaterials and bulk materials, Reduction of dimensions 3D, 2D, 1D, 0D materials, various morphologies of nanomaterials, Bottom up and top down approaches, size dependent physical properties, Nano cluster.

#### Unit IV:

**Nanotechnology**- Different methods of synthesis of nanomaterials (Wet chemical, Sol-gel, and HCR Technique), Determination of size of nanoparticles by particle analyzer(BET) and Debye- Scherer's formula, Characterization technique of SEM and TEM, application of nanomaterials in various fields (General).

#### **References and Text books -**

- 1. Quantum Mechanics, Statistical Mechanics and SSP, by- D. Chattopadhay, P. C. Rakshit.
- 2. Fundamentals of Quantum Mechanics, by- P. R. Waghmare
- 3. Quantum Mechanics, by- John L. Powel, Bernd Crasemann.
- 4. Quantum Mechanics, by- Mathews and Venketesan.
- 5. Quantum Mechanics, by- A. K. Ghatak, S. lokanathan.
- 6. Quantum Mechanics, by-S. P. Singh, M. K. Bagde and Kamal Singh.
- 7. Quantum Mechanics, by- Chatwal, Anand, Himalaya publications.
- 8. Advanced Quantum Mechanics, by- Satya Prakash, Pragati Publications.
- 9. Introduction to Nano Technology, by- C. P. Poole, Jr. F. J. Owens.
- 10. Nano Technology, by- T. J. Daming.
- 11. Nano Structure and Nano Materials, by- M. Balkrishanarao, K. Krishana Reddy.
- 12. Nano Technology, by- Rakesh Rathi.

# B. Sc. Final Year (Semester V) Course -

#### **Physics Practical (503)**

- 1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of university practical examination in 6 hours.
- 2. The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 Marks each) - 18 Marks Record book -06 Marks Viva Voce -06 Marks Total

30 Marks

List of the experiments-

- 1. To study the absorption spectra of iodine vapour and to determine its dissociation energy and force constant.
- 2. To estimate the temperature of sodium flame by studying the reversal of the spectral lines (D- line).
- 3. To determine the electric charge of an electron by Millikan's oil drop method.
- 4. To determine the value of e/m of an electron by Busch's helical beam method.
- 5. To determine the value of e/m of an electron by Thomson method.
- 6. To determine electronic charge and work function of the cathode material using photocell.
- 7. To determine the plank's constant 'h' by vacuum type photocell using DPMS.
- 8. To determine Planck's constant by photocell.
- 9. To determine Planck's constant by solar cell.
- 10. To determine Hall coefficient and mobility of charge carriers in a semiconductor.
- 11. To verify the laws of probability distribution throwing one coin, two coins and ten coins.
- 12. Study of statistical distribution from the given data and to find most probable, average value and RMS value.
- 13. Study of random decay of nuclear disintegration and determination of decay constant using one colored face dices.
- 14. To show that deviation of probability of an event from theoretical value decreases with increase in number of events.
- 15. Determination of average grain size of a particle from X-Ray diffraction spectra using Debye-Scherrer Formula.
- 16. Study of particle size of nano particles by SEM /TEM method.
- 17. Determination of size of nano particles by particle analyzer (BET).
- 18. To determine the transmission coefficient of a transmitting plate using photometer.
- 19. To determine the electro-chemical equivalent of hydrogen using Hoffman's tube.
- 20. To measure A. C. / D. C. voltage using a C. R. O. and to calculate it's deflection sensitivity.
- 21. To determine the unknown frequency /to compare the frequency of two unknown signals using C. R.O.
- 22. To study and trace different wave forms of oscillator using C. R. O.
- 23. Measurement of thermo emf.
- 24. To determine the concentration of sugar solution by half shade polarimeter.
- 25. Measurement of global and diffuse radiation using pyranometer.

#### B. Sc. Final Year (Semester VI) Course-PHYSICS - Paper-I (601) (Relativity, Nuclear physics and Bio Physics)

# Marks-50

Time- 30 hours

# Unit I:

**Relativity**- Frame of reference, Inertial and non inertial frames, Galilean transformation equations, Galilean invariance, Michelson-Morley experiment, Postulates of the special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, , Variation of mass with velocity, Mass energy equivalence.

# Unit II:

**Nuclear physics**- G. M. counter, Wilson cloud chamber, Cyclotron, Linear accelerator, Nuclear reaction, Discovery of neutron, Packing fraction, Mass defect and binding energy, Nuclear fission, Liquid drop model, Chain reaction, Nuclear reactors, Nuclear fusion, Cosmic ray, Elementary particles, Shell model of the nucleus.

# Unit III:

**Nuclear physics**- Alpha decay, Range of  $\alpha$  particle, Geiger Nuttal law, Magnetic spectrometer for energy of  $\alpha$  particle, Tunneling, Gamow's theory of  $\alpha$  decay,  $\beta$ - decay, Measurement of energy of  $\beta$  particle and end point energy, Neutrino theory of  $\beta$ - decay,  $\gamma$ - decay, Energy of  $\gamma$  photon.

#### Unit IV:

**Bio physics**-History of bio physics, Bio Potential- compound action Potentials of the human body, Electrocardiogram for heart (ECG), Electroencephalogram for brain (EEG), Electroretinogram for eye retina (ERG), Electromyogram for muscle (EMG) and Sonography (Working mechanism).

**Bioinstruments**- Basic principle, construction and working of colorimeters, Spectrophotometer, PH-Meter and centrifuge measurement.

#### **Reference and Text books -**

- 01. Nuclear Physics, by- S. N. Ghoshal.
- 02. Atomic and Nuclear physics, by- N. Subramanyam, Brijlal.
- 03. Introduction to Nuclear physics, by-H. A. Enge.
- 04. Atomic and Nuclear physics, by- T. A. Littlefield, N. Thorley.
- 05. Introduction to special theory of Relativity, by-Shrivastava
- 06. Elements of special theory of Relativity, by- S. P. Singh and M. K. Bagde.
- 07. Introduction to theory of Relativity, by- P. G. Bergmann
- 08. Introduction to Bio Physics, by- P. Narayanan, New Age Publications.
- 09. Medical Instrumentation, by- KhandpurTMH.
- 10. Text Book of Bio Physics, by- R. N. Roy
- 11. Laboratory manuals of Bio Physics Instruments, by- P. B. Vidyasagar.
- 12. Bio physics, by- Vatsala Piramal, Dominant Publications and Distributions, New Delhi.

#### B. Sc. Final Year (Semester VI) Course-

#### PHYSICS - Paper-II (602)

(Electronics, Fiber optics, Communication and Digital electronics)

# Marks-50

Time- 30hours

#### Unit I:

**Amplifiers**- Classification of amplifiers, multistage amplifiers, **Operational amplifier**- parameters, Basic idea of IC-741, Application of Op. Amp. as inverting, Non inverting, Adder, Subtractor, Integrator and Differentiator, **Oscillators**- Concept of feedback, Physical consideration of tuned circuits, Phase shift oscillator, Hartley oscillator, Colpitts oscillator.

#### Unit II:

**Fiber optics-** Importance of optical fiber, Propagation of light waves in optical fiber, Basic structure, Stepped index monomode fiber, Graded index fiber, Acceptance angle and acceptance cone, Numerical aperture, Fiber losses and their units (basic concept), Electrical and optical band width, bandwidth length product, Dispersion in optical fiber.

#### Unit III:

**Communication-** Introduction, amplitude modulation - Frequency spectrum, Modulation factor, over modulation, Percentage modulation, Expression for Power and Currents in AM wave, disadvantages, **Frequency modulation** - Frequency deviation, Carrier swing, Modulation index, Deviation ratio, Expression for FM wave, Frequency spectrum, significant side band terms, FM band width, Merits and demerits.

#### UNIT IV:

**Number Systems**- Unitary systems, Binary, decimal, octal, hexadecimal and their interconversions, Binary coded decimal (BCD), Addition and subtraction of binary numbers, 1S, 2S and 10S compliment, basic logic gates, NOR, NAND, Ex-OR, Ex-NOR and their truth table, Half adder, Full adder, Half subtractor and full subtractor, Boolean equations, De Morgan's theorem and its verification.

#### References and Text books -

- Op. Amps and Linear Intergated circuits 2<sup>nd</sup> Edition, by- Ramakant Gaikwad, PHI Publications.
  Digital and Analog Technique 1<sup>st</sup> Edition, by- Navneet, Gokhale, Kale, Kitab Mahal Nagpur.
- 3. Basic Electronics (Solid State), by- B. C. Therja.
- 4. Optoelectronics and fiber optics communication, by- C. K. Sarkar, D.C. Sarkar.

- 5. Laser and Optical fiber communication, by-P.Sarah.
- 6. An introduction to fiber optics, by-R. Allen Shotwell.
- 7. Optical fiber communication, by-John M. Senior.
- 8. Communication Electronics, by- A. Kumar
- 9. Digital Electronics, by- V. K. Jain
- 10. Digital Principle and Application, by- Malvino and Leach
- 11. Digital Electronics and It's Application, by- R. P. Jain
- 12. Digital computer Electronics, II nd Edition, by- Malvino, TMH Edition.

#### **B. Sc. Final Year (Semester VI) Course**

#### - Physics Practical (603)

- 1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of university practical examination in 6 hours.
- 2. The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 N	Aarks each) - 18 Marks
Record book	-06 Marks
Viva Voce	-06 Marks
Total	30 Marks

List of the experiments-

- 1. To draw the histogram of theoretical Gaussian curve.
- 2. Recording and analysis of ECG Signals.
- 3. Verification of Beer's- Lambert's law.
- 4. To determine pH value of Amino acids.
- 5. Measurement of BP and recording of Kortov sound.
- 6. Measurement of body temperature using GSR and thermister probe.
- 7. Measurement of skin resistance using GSR.
- 8. To draw the plateau curve of a given Geiger Mueller counter
- 9. Study of Op. Amp. as an Inverting and Non Inverting amplifier.
- 10. Study of Op. Amp. as an Adder and Subtractor.
- 11. Study of Op. Amp. as an Integrator and differentiator.
- 12. To construct and study the working of a phase shift oscillator.
- 13. Study of Hartley Oscillators.
- 14. Study of Colpitts Oscillators.
- 15. Study of Amplitude modulation.
- 16. Study of diode as an AM detector.
- 17. Study of diode as clipper, clamper and voltage doublers.
- 18. Study of Frequency modulation using IC.
- 19. Study of F M detector using IC.
- 20. Study of basic gates (AND, OR, NOT)
- 21. Study of logic gates (using IC) and verification of De Morgan's theorem.
- 22. To study the characteristics of NAND/NOR gate and its use as a universal gate.
- 23. Verification of laws of Boolean algebra using NAND gate.
- 24. Study of Ex- OR gate as a half adder and full adder.
- 25. Study of Ex- OR gate as a half subtractor and full subtractor.

#### **Books for Experimental Physics –**

- 1. B. Sc. practical physics, by- Harnam Singh, DR. P.S. Hemne, S Chand Publications
- 2. Practical Physics, Volume-I, II by- Gupta and Kumar.
- 3. Advanced practical physics, Volume I, II by- DR. S. P. Singh.
- 4. Advanced Viva-Voce in physics, Volume I, II by-Gupta and Narain.
- 5. Laboratory Physics, Part A and B, by-Berkeley Physics Laboratory.
- 6. Laboratory Physics (Laser Exp.), by- Berkeley Physics Laboratory.
- 7. University Practical Physics with Viva Voce, by-C. K. Bhattacharya (C. B. S. Publications, Delhi).

- 8. A Textbook of Practical Physics, by-Brijlal and Subramanyam.
- 9. Introduction to Experimentation, by-B. J. Brinkwork (The English University Press Ltd.).
- 10. Advanced Practical Physics, Vol. I and II, by- M. S. Chauhan, S. P. Sinha.
- 11. Experimental Physics, by-C. Daish (Hodder and Sons, 1970).
- 12. Practical Physics for B. Sc., by- A. Dhanalaxmi , A Williams .
- 13. Experiments in Electronics, by-Paunik S. Jabbar.
- 14. Digital Electronics Practice, by- Jain, Anand Integrated Circuits, (Tata Mc Graw Hill).
- 15. A Laboratory Manual of Physics for Undergraduate Classes, by-D. P. Khandelwal (Vani Publishing House, New Delhi).
- 16. Experiments in Modern Physics, by-Olon.
- 17. B. Sc. Practical Physics, by-K. Hanumantha Rao, D. P. Siva Ramrah, V. Krishna Murthy.
- 18. Advanced Practical Physics, by S. S. Sharma (Business Promotion Bureau, Delhi).
- 19. B. Sc. Practical Physics by- Harnam Singh (S Chand).
- 20. Advanced Practical Physics, by- S. P. Singh (Pragati Prakashan).
- 21. Experiments in Electronics, by-S. V. Subramanyam (Macmillan India Ltd.).
- 22. Experimental Crystal Physics, by-W. A. Wooster, A. Breton.
- 23. Introduction to Biomedical Electronics, by-Joseph Bovy

#### (Mc Graw Hill).

24. Handbook of Biomedical Instrumentation, by-R. S.

#### Khandpur.

25. Acoustic Measurement, by-L. Beranek.

- 26. Fundamentals of Acoustics, by-Kinsler, Frey.
- 27. Solar Cells, by-M. A. Green.
- 28. Electronic Communication, by-Roddy Coolen.

#### Semester 1 Paper 1

Electronic Components, Network Theorems

#### Unit 1

Definition, types, identification and uses of electronic components: Resistors, Capacitors, Inductors, Switches, Transformers and Relays Block diagram of C. R. O.

#### Unit 2

Ideal Voltage and Current sources (Internal impedance of battery and its effect on its performance), Kirchoff's current and voltage laws, Voltage and current divider circuits, Superposition, Thevenin, Norton, Maximum power transfer theorems (Statement and simple numerical) ( DC circuits only)

#### Unit 3

Introduction to semiconductors: Concept of energy band diagram (Conductor, Semiconductor, Insulator), Intrinsic and extrinsic semiconductor (P type, N type), diffusion junction, depletion layer, Barrier potential, PN Junction diode, forward and reverse bias characteristics of diode, Avalanche and Zener effect; Zener diode, L.E.D.

#### Unit 4

The bipolar junction transistor, construction of B. J. T. , modes of B.J.T. (CE, CC, CB), transistor equation;  $\alpha$ ,  $\beta$  and their relationship, junction biasing, Input, output and transfer characteristics of BJT in CE mode, Transistor Biasing (Voltage divider and emitter biasing only), DC load line, Q point, transistor as switch

#### **B.Sc. I ELECTRONICS PRACTICAL**

#### Semester 1 Section A

- 1 Study of laws of series resistor and application as voltage divider.
- 2 Study of laws of parallel resistor and application as current divider.
- 3 Study of laws of series capacitor and application as voltage divider.
- 4 Study of laws of parallel capacitor and application as current divider.
- 5 Verification of Terman's equation for inductance. Reactance characteristics of inductor
- 6 Study of transformer.
- 7 Study of battery as practical (i) voltage source (ii) current source.
- 8 Study of maximum power transfer.
- 9 Study of Forward Bias characteristics of diode. (PN & LED)
- **10** Study of Reverse Bias characteristics of ZENER diode.
- **11** Study of Characteristics of BJT. (Input, Output, Transfer)
- **12** Study of voltage divider biasing of transistor.
- **13** Verification of Norton's Theorem.
- **14** Verification of Thevenins Theorem.

<b>B.Sc.</b>	ELECTRONICS	Semester	1	Paper	1
		Reference Books			

1	Basic Electronics solid state physics	B.L.Theraja S.Chand and company
2	Electronic Devices and circuits	Allen Mottershed Prentice hall of India pvt.ltd.
3	An Introduction to Electronics	R.G.Kale,U.K.Puranik,V.N.Pendse,A .A.Sakale Kitab mahal
4	Basic Electronics	Grob Tata McGraw Hill
5	Electronic Devices	T.L.Floyd Pearson Education Asia
6	Electronic Principles	Malvino Tata McGraw Hill
7	Electronic components and materials	Madhuri Joshi Schroff pub. And distributors
8	Electronic components and materials	S.M.Dhir TMH
9	Network analysis	Van valkenburg PHI

**B.Sc. ELECTRONICS** 

Semester 1 Paper 2

Fundamentals of Digital Electronics

#### Unit 1

Number Systems and Codes: Decimal, Binary, Octal, Hexadecimal, representation of integer, fraction, mixed numbers and their mutual conversion, Complement of numbers-1's, 2's, complements, addition and subtraction using 1's and 2's complement method sign and magnitude of numbers. Codes- BCD, 8421, Excess 3, Parity and gray code

#### Unit 2

Logic gates- OR, AND, NOT, NAND, NOR, XOR and XNOR gates and their truth table, Boolean Laws, double inversion, De Morgans and Duality theorems, use of NAND and NOR as universal building blocks

#### Unit 3

Karnaugh Maps: pair, quads, octets, minterm, max term in K Map, K-map for 2,3,4 variables, concept of SOP and POS, simplification of SOP and POS logic expressions using K-map, Design of binary to gray code converter, gray to binary code converter using K-map

#### Unit 4

Combinational Logic Circuits- Half Adder, full adder, half subtracter and full subtracter, Concept of Encoder, Concept of Decoder: BCD to gray converter, BCD to seven segment converter, parity generator checker, 4-bit Full Adder/ subtracter, Concept of multiplexer, 4:1 mux using gate, Concept of demultiplexer, 1:4 demux using gate

#### B.Sc. I **ELECTRONICS PRACTICAL**

Semester 1 Section B

- Study of basic logic gates. 1
- 2 Study of NAND as universal gate.
- 3 Study of NOR as universal gate.
- 4 Verification of Demorgan's Theorem.
- 5 Simplification of logic expressions using Boolean algebra.
- 6 Study of binary to gray code converter using K map.
- 7 Study of gray to binary code converter using K map.
- 8 Study of Multiplexer using gates.
- 9 Study of De Multiplexer using gates.
- 10 Study of Multiplexer using IC.
- Study of De- Multiplexer using IC 11
- Study of BCD to 7 segment decoder. 12
- Construction and study of half adder and full adder. 13
- Construction and study of half subtractor and full subtractor. 14
- Verification of Boolean laws & Verification of duality theorem 15

16 **B.Sc. ELECTRONICS** Semester 1 **Paper** 2 **Reference Books** 1 Digital principles and applications A.P.Malvino, D.P.Leach McGraw Hill Book Co. 2 **Principles of digital Electronics** M.B.Matsagar, V.S.Kale Vision publication 3 Modern digital Electronics **R**.**P**.Jain Tata McGraw Hill publishing co.ltd Floyd,Jain **Digital fundamentals** 4 Pearson 5 2000 solved problems in digital S.P.Bali Electronics Tata McGraw Hill publishing co.ltd. 6 Electronic circuits and systems Y.N.Bapat Analog and digital Tata McGraw Hill publishing co.ltd. **B.S.Nair Prentice hall** 7 Digital electronics and logic design 8 digital computer electronics Malvino, Brown Tata McGraw Hill 9 **Fundamentals of Digital Electronics** C.V.Dhuley and V.M. Ghodki

**B.Sc. ELECTRONICS**  Semester 2 Paper 1

#### Semiconductor Devices

#### Unit 1

Construction, working, characteristics and applications of JFET, MOSFET (depletion and enhancement type), parameters of JFET and their relationship parameters of MOSFET and their relationship

#### Unit 2

Construction, working, characteristics and applications of Silicon Controlled Rectifier, DIAC, TRIAC and UJT, UJT as relaxation oscillator

#### Unit 3

Amplifier parameters, notations, concept and definition of h-parameters, open circuit and short circuit tests, Introduction to input impedance, output impedance, current, voltage and power gains using h parameters, classification of amplifiers (Descriptive ideas only)

#### Unit 4

Introduction to power transistor, difference between Voltage and power amplifiers, transformer coupled class A power amplifier and its efficiency, class B Push-pull amplifier, derivation for efficiency, complementary symmetry power amplifier with two power supplies

#### **B.Sc. I ELECTRONICS PRACTICAL**

Semester 2 Section A

- **1** Study of JFET characteristics.
- 2 Study of MOSFET characteristics.
- **3** Study of SCR characteristics.
- 4 Study of DIAC characteristics.
- 5 Study of UJT characteristics.
- 6 Study of UJT as relaxation oscillator.
- 7 Study of Transistor as a switch.
- 8 Study of transistor as voltage amplifier using CRO.
- 9 Study of class A power amplifier.
- **10** Study of TRIAC characteristics.
- **11** Study of Band width in single stage amplifier.
- **12** Study of complementary symmetry power amplifier.

**B.Sc. ELECTRONICS** 

Semester 2 Paper

1

# Reference Books

1	Principles of Electronics	V.K.Mehta,Rohit Mehta
2	Functional circuits in Electronics	S.G.Pimpale,Sushama Pimpale Mcmillan India ltd.
3	Electronics,Fundamental and applications	Ryder PHI
4	Elements of electronics	M.K.Bagde,S.P.Singh,Kamal singh S.Chand and co.
5	Op-Amp and linear circuits	Gaikwad PHI
6	Electronic Instrumentation	Khedkar
7	Monograph on electronic design principles	Goel, Khaitan Khanna publisher
8	Basic electronics and linear cicuits	Bhargava,KUlshreshtha,Gupta Technical education series
9	EDC I, EDC II	A.P. Godse, U.P.Bakshi Technical Publishers pune

Semester 2 Paper 2

Advanced Digital Electronics

#### Unit 1

Logic Families: Characteristics of digital ICs, construction and working of TTL NAND and NOR gates, construction and working of CMOS NAND and NOR gates, Tristate logic, comparison of TTL and CMOS logic families with respect to propagation delay, power consumption, noise immunity, noise margin, fan in and fan out.

#### Unit 2

Sequential Logic Circuits- Concepts of Edge and Level Triggering, Propagation Delay, set up time, hold time, R-S Flip Flop, Clocked R-S Flip Flop, Limitations of R-S FF, D FF, JK FF, preset and clear, Limitations of JK FF: Race around Condition, JKMS FF

#### Unit 3

Counters: Asynchronous, up/down, Decade, Synchronous, Modified counter, Ring Counter, Johnson counter (Truth tables and timing diagrams) (4 bit)

#### Unit 4

Registers: Buffer, left shift, right shift, SISO, SIPO, PISO, PIPO Registers, introduction to memories, classification, Memory expansion (word size and word capacity)

#### **B.Sc. I ELECTRONICS PRACTICAL**

Semester 2 Section B

- **1** Switching characteristics of NOR.
- 2 Switching characteristics of NAND.
- 3 Study of RS Flip Flop using NAND/NOR gate.
- 4 Study of clocked RS Flip Flop using NAND/NOR gate.
- 5 Study of D Flip Flop using NAND/NOR gate.
- 6 Study of JK MS FF.
- 7 Construction and study of decade counter.
- 8 Study of mod-counter.
- 9 Study of ring counter.
- **10** Study of Johnson counter.
- **11** Study of SISO register.
- **12** Study of SIPO register.
- **13** Study of PISO register.
- **14** Study of PIPO register.
- **15** Construction and study of synchronous counter.

**Reference Books** 

1	Digital principles and applications	A.P.Malvino,D.P.Leach McGraw Hill Book Co.
2	Principles of digital Electronics	M.B.Matsagar, V.S.Kale Vision publication
3	Modern digital Electronics	R.P.Jain Tata McGraw Hill publishing co.ltd
4	Digital fundamentals	Floyd,Jain Pearson
5	2000 solved problems in digital Electronics	S.P.Bali Tata McGraw Hill publishing co.ltd.
6	Electronic circuits and systems Analog and digital	Y.N.Bapat Tata McGraw Hill publishing co.ltd.
7	Digital electronics and logic design	B.S.Nair Prentice hall
8	digital computer electronics	Malvino,Brown Tata McGraw Hill
9	Fundamentals of Digital Electronics	C.V.Dhuley and V.M. Ghodki

#### **B.Sc. ELECTRONICS**

**OP AMP And Power Supply** 

Semester

3

Paper

1

#### Unit 1

Introduction to DC amplifier, difference amplifier, Need of two power supplies, working of difference amplifier, differential mode gain, common mode gain, C.M.R.R., IC OP-AMP (block diagram), parameters of OP AMP and characteristics of an ideal OP AMP.

#### Unit 2

OP AMP as an inverting amplifier, concept of virtual ground, non-inverting amplifier, unity gain amplifier, adder, subtractor, integrator, differentiator, comparator, zero crossing detector, Schmitt trigger

#### Unit 3

Semester 2 Paper

2

Half wave rectifier, full wave rectifier, bridge rectifier; concept of filter (capacitive). Unregulated, regulated PS, power supply parameters – ripple factor, efficiency, line regulation, load regulation, Zener regulator, Regulated power supply design using series pass transistor, short circuit protection

#### Unit 4

General features of IC regulators, design of fixed and variable power supply, 78xx,79xx, LM 317, design of dual power supply, LM 317 as variable regulator, Limitations of linear regulator, Switching regulator- (SMPS), Concept of Low Drop Out regulator (LDO)

# **B.Sc. II**

#### Semester 3 Section A

- 1 Study of Op-amp as inverting and sign changer amplifier.
- 2 Study of Op-amp as Non-inverting and unity gain amplifier.
- **3** Op-amp as adder and averaging amplifier.
- 4 Op-amp as difference amplifier. (Subtractor)
- 5 Op-amp as integrator.
- 6 Op-amp as Differentiator
- 7 Op-amp as comparator and zero crossing detector.
- 8 Op-amp as Schmitt trigger.
- 9 Study of Half wave rectifier.
- **10** Study of Full wave rectifier.
- **11** Study of Full wave Bridge rectifier.
- 12 Study of Zener regulator.
- **13** Regulated P.S. using series pass transistor.
- 14 Study of LM-317 (variable regulator)
- 15 Study of 78XX
- 16 Study of 79XX
- 17 Study of difference using transistors.

Semester 3 Paper 1

Reference Books

1	Principles of Electronics	V.K.Mehta,Rohit Mehta
2	Functional circuits in Electronics	S.G.Pimpale,Sushama Pimpale Mcmillan India ltd.
3	Electronics,Fundamental and applications	Ryder PHI
4	Elements of electronics	M.K.Bagde,S.P.Singh,Kamal singh S.Chand and co.
5	Op-Amp and linear circuits	Gaikwad PHI
6	Electronic Instrumentation	Khedkar
7	Monograph on electronic design principles	Goel, Khaitan Khanna publisher
8	Basic electronics and linear cicuits	Bhargava,KUlshreshtha,Gupta Technical education series
9	EDC I, EDC II	A.P. Godse, U.P.Bakshi Technical Publishers pune

Semester 3 Paper 2

Electronic Circuit Design

#### Unit 1

Concept development: defining inputs, process and output, generating ideas, screening ideas, developing and testing ideas, Simulation, Prototyping or Trial Production, Design Review, techno-commercial feasibility, product development, Erogonomic & asthetic design, quality assurance and compliance.

#### Unit 2

Introduction to circuit maker, basics, accessing tools& features, saving schematic options, file management, drawing a schematic, creating simple RC circuit, setting up the analysis, running the simulation, mix signal simulation example.

#### Unit 3

Digital logic simulation, setting of parameters, analysis of simple circuits, Analog / mixed signal simulation setting of parameters, analysis of simple circuits.

#### Unit 4

Introduction to Virtual Instrumentation,

Virtual Instrumentation System: Interface Bus, Input devices, Output devices, Software, Advantages of Virtual Instrumentation, Applications of Virtual Instrumentation, Virtual Instruments beyond the Personal Computer:

Semester 3 Section B

#### B.Sc. II ELECTRONICS PRACTICAL

- 1 Study transient & AC analysis of RC circuit
- 2 Study transient & AC analysis of different OP-Amp as comparator
- 3 Study transient & AC analysis of different OP-Amp as inverting amplifier
- 4 Study transient & AC analysis of different OP-Amp as IA
- 5 Study CE amplifier parameters
- 6 Study CB amplifier parameters
- 7 Study CD FET amplifier parameters
- 8 Study of MOSFET Characteristics
- 9 Study of Low Pass Filter
- **10** Study of VI for Function Generator
- **11** Study of VI for Display(CRO)
- 12 Study of Average / Running average VI

# B.Sc. ELECTRONICS Semester 3 Paper 2

Reference Books

1 Measurements of high frequency acoustic characteristics

Vilas Ghodki, Satish Sharma and S Rajagopalan

2 Circuit maker mannual

Semester 4 Paper 1

Analogue And Digital Techniques

#### Unit 1

Feedback: type, positive and negative feedback, Barkhausen criterion, Oscillators, types (AF and RF), basic oscillator action, L-C oscillator :Colpitts oscillator, RC oscillator using OP Amp ,phase shift oscillator, Wein bridge oscillator, oscillator stability, crystal oscillator, NOT gate based crystal oscillator.

#### Unit 2

Study of OP AMP as: astable multivibrator (asymmetric and symmetric), monostable multivibrator (simple circuit), concept and working of sample and hold circuit, concept of Instrumentation Amplifier (three OP Amp circuit) and working

#### Unit 3

D/A converter, parameter: range, resolution, linearity and speed, weighted type D/A, limitations of weighted type D/A, R-2R D/A using Op Amp, limitations, types of D/A output (voltage , current, differential), dual bias D/A

#### Unit 4

Need for A/D conversion, parameters: range, resolution and speed, single slope A/D converters, dual slope A/D converter, Counter type, successive approximation type, Flash type, sampling theorem, Reference voltage and ADC stability

# **B.Sc. II**

#### Semester 4 Section A

- 1 Study of OP-amp based Wein bridge oscillator.
- 2 Study of OP-amp based Phase shift oscillator.
- 3 Study of Colpitt's oscillator.
- 4 Study of Op-amp as astable multi vibrator.
- 5 Study of Op-amp as Mono stable multi vibrator.
- 6 Study of Instrumentation amplifier.
- 7 Study of successive approximation ADC.
- 8 Study of Flash type ADC.
- 9 Study of Single slope ADC.
- **10** Study of Dual slope ADC.
- 11 Study of Binary weighted DAC.
- 12 Study of ladder type DAC
- 13 Study of NOT gate based crystal oscillator.
- 14 Study of Sample and hold circuit.

Semester

Paper 1

4

Reference Books

1	Digital and analogue Techniques	G.N.Navaneeth,V.M.Gokhale,R.G.Kale Kitab mahal
2	Digital principles and applications	A.P.Malvino,D.P.Leach McGraw Hill Book Co.
3	Op-Amp and linear circuits	Gaikwad PHI
4	Principles of digital Electronics	M.B.Matsagar, V.S.Kale Vision publication
5	Modern digital Electronics	R.P.Jain Tata McGraw Hill publishing co.ltd.
6	Digital fundamentals	Floyd, Jain Pearso 1
7	2000 solved problems in digital Electronics	S.P.Bali Tata McGraw Hill publishing co.ltd.
8	Electronic circuits and systems Analog and digital	Y.N.Bapat Tata McGraw Hill publishing co.ltd.
9		
	Digital electronics and logic design	B.S.Nair Prentice hall
10	Digital electronics and logic design Digital computer electronics	B.S.Nair Prentice hall Malvino,Brown Tata McGraw Hill

Semester 4 Paper 2

Electronic Instrumentation

#### Unit 1

Block diagram for electronic system, Defining the system, characteristics, Analog, digital, real, virtual, dedicated, versatile, stand alone, PC based instruments. Concept of calibration, standards for calibration

#### Unit 2

Sensors, actuators, transducers, active & passive transducers, characteristics, Passive : Thermister (NTC & PTC), LM35, L.D.R. photo-transistor Active : Piezo-electric transducer Digital: pressure sensor (MPXV4006DP)

#### Unit 3

Block diagram of : temperature measurement using thermister, temperature measurement using LM35, advantage over thermister lux meter using LDR, colorimeter using LDR insect repellent using piezo buzzer

#### Unit 4

Man-Instrument system, components, introduction to physiological system, generation of bio potential, Block diagram and working of EEG, ECG & EMG, electrical shock hazards, precautions, safety codes biomedical

# **B.Sc. II**

**Paper** 

2

4

- 1 Study transfer characteristics of NTC type thermister
- 2 Study resolution in characteristics of NTC type thermister
- 3 Study transfer characteristics of LM 35
- 4 Study transfer characteristics of Water heater (around 300W)
- 5 Study of ON/ OFF type thermo-state using LM 35
- 6 Study transfer characteristics of LDR
- 7 Study transfer characteristics of Piezo-electric transducer
- 8 Comparative study of accuracy in 3 <sup>1</sup>/<sub>2</sub> digit, 4 <sup>1</sup>/<sub>2</sub> digit 5 <sup>1</sup>/<sub>2</sub> digit Multimeters
- 9 Directivity study of carbon Mic.
- 10 "Look up table" based o/p using microcontroller

#### **B.Sc. ELECTRONICS**

Semester

**Reference Books** 

Applied electronics and Instrumentation C.M.Dhir Tata McGraw Hill
 Digital Instrumentation Bouwens Tata McGraw Hill
 Electronic Instrumentation Khedkar
 Modern . electronic Instrumentation and measurement techniques

#### **B.Sc. ELECTRONICS**

Semester 5 Paper 1

**Electronics Communication** 

#### Unit 1

Introduction to Electronics communication, block diagram of communication system, Types of communication: analog, digital; simplex, duplex; baseband, modulated, concept of modulation, need for modulation, types of modulation (AM, FM, PM)

#### Unit 2

Propagation modes of signals: ground waves, sky waves, Ionosphere and satellite; antenna fundamentals, basic principles and types.

#### Unit 3

Digital communication: Introduction, synchronous, asynchronous transmission, Shannon theorem, ASK, FSK, and PSK modulation.

# Unit 4

Fiber optic communication system, Advantages of FOC, concept of Fax, concept of cellular telephone, block diagram of cellular telephone, advantages

# **B.Sc. III**
- 1 Study of Half duplex communication system using PC/ $\mu$ C (2 wire interface)
- 2 Study of Full duplex communication system using PC/ $\mu$ C (3 wire interface)
- Study of Full duplex
   ASK using op-Amp
- 4 FSK using op-Amp
- 5 Study of AM detector
- 6 Study of narrow band amplifier using op-amp/ Transistor
- 7 Study of intensity characteristics of LASER diode
- 8 X-bee interface using PC/  $\mu$ C / field strength study
- 9 IR Link study
- **10** Wire impedance measurement

B.Sc.		ELECTRONICS	Sem	ester	5	Paper	1
		Reference Bo	ooks				
	1	Electronic communication system	John ker	nnedy T	'ata N	/IcGraw Hi	11
	2	Communication electronics principles and application	Frenzel	Tata I	McGı	aw Hill	
	3						
	4						

**B.Sc. ELECTRONICS** 

Semester 5 Paper 2

Fundamentals of Microprocessor

#### Unit 1

Block diagram of Intel 8085, ALU, Timing and control unit, General purpose registers, Accumulator, PC, SP, IR, ID, Interrupt, Address and Data bus multiplexing, Flags. Instruction Cycle: T-states, Fetch operation, Execute operation, Machine cycle

#### Unit 2

Addressing mode, instruction Set- Data transfer group, arithmetic group, logic group, simple programs

#### Unit 3

Instruction set: branch control group, I/O and machine control group, simple programs, stack and subroutines

#### Unit 4

Need for interfacing, modes of data transfer, synchronous and asynchronous, interrupt driven, DMA, PPI 8255- Block diagram, modes, control word format

# B.Sc. ELECTRONICS PRACTICAL Semester 5 Section

- **1** Program based on Data transfer instructions.
- 2 Program based on Arithmatic instructions.
- **3** Program based on Logical instructions.
- 4 Program based on Branch instructions.
- 5 Program based on Control instructions.
- **6** Study of PPI 8255.

B.Sc.		ELECTRONICS	Semester 5 Paper 2
		Reference Bo	oks
	1	Fundamentals of Microprocessor and Microcomputers	B.Ram Dhanpat Rai publications
	2	Microprocessor Architecture, programming and applications with 8085/8080 A	Ramesh S. Gaonkar Wiley eastern ltd.
	3	Introduction to microprocessor	A.P. Mathur Tata McGraw Hill
	4	Microprocessor and interfacing	D.V.Hall Tata McGraw Hill
	5	Introduction to Microprocessors	Vilas Ghodki and Satish Sharma

B

#### **B.Sc. ELECTRONICS**

#### Semester 6 Paper 1

Programming in "C"

#### Unit 1

Constant, Variables and Operators: Character set, C tokens, constant, Keyword, identifiers, variables, data types, declaration of variables, Arithmetic, relational logical, assignment, increment, conditional, bitwise, operators, Arithmetic expression, evaluation of expression, precedence of operators, input/output functions

#### Unit 2

Control Structures & Arrays: if- statements, if-else statement, switch statement, go-to statement, while statement, do-while statement, for statement, one dimensional array

#### Unit 3

User Defined Functions, Types of functions, return values and their types, scope and lifetime of variables in function; basic concept of structure and unions, difference between structure and union

#### Unit 4

Pointers: Basic concept, expression, variables Defining and opening file, closing a file, I/O operations on file, command line arguments, port interfacing.

# B.Sc. ELECTRONICS PRACTICAL Semester 6 Section A

- 1 Programs based on use of Variables, Operators, Input Output function
- 2 Programs based on Control Structure using if, if-else, switch, goto, while & do while
- 3 Programs based on use of one dimensional Array, Operations on array
- 4 Programs based on function writing, Use of structure and Union
- 5 Programs based on pointer operation, file operation
- 6 Programs based on communication with external data source like Printer & serial port

B.Sc. ELECTRONICS Semester 6 Paper 1

**Reference Books** 

1	Let us C	Y.Kanetkar			
2	Gate to C programming	Kishor S B, Vilas Ghodki and Madhavi			
3	C in depth	Shrivastava BPB publication			
4	Programming in ANSI C-E	Balgurusamy Tata McGraw Hill			
5	Programming with C	Byron Gottfried Schaums outline series Tata McGraw Hill			

6

**B.Sc. ELECTRONICS** 

Semester 6 Paper 2

Microcontroller 8051

#### Unit 1

Architecture and features, Internal and External memory, Flags, SFR Map, SFR Function, Accumulator, Register B, Port registers (P0, P1, P2 and P3), Power Management (PCON)

#### Unit 2

Instruction set: Data transfer, logical, arithmetic, interrupt handler, Addressing Modes

#### Unit 3

Subroutine and Stack, Need for Subroutine LCALL and RETURN Instructions, ACALL Instructions, Nesting of subroutine, Stack Operation and Stack Instruction, Branching (Jump Instruction), simple programs

#### Unit 4

Interfacing with Keyboard, display - LCD (16 x 2), ADC and DAC, LED Matrix and Serial communication with personal computer

## B.Sc. ELECTRONICS PRACTICAL III

Semester 6 Section B

- 1 LED Blink
- 2 Relay interface
- 3 Stepper Motor Interface
- 4 16x2 Interface
- 5 Study of bit operation on port(A,B,C,D)
- 6 LED Blink using timer
- 7 Frequency Generator using timer
- 8 External frequency counting timer
- 9 Interrupt driven operation
- **10** Single blink on key I/P
- **11** Opto- triac interface
- **12** Key to clk/CC
- **13** Serial interface with PC
- 14 ADC 0808 interface
- 15 DAC 0808 interface
- **16** IIC interface using R.T.C.

B.Sc.	ELECTRONICS	Semester 6 Paper 2
	Reference	e Books
1	8051 microcontroller	V.Udayshankara, Mallikarjuna swamy Tata McGraw Hill
2	Microcontroller theory and applications	A.V.Deshmukh Tata McGraw Hill
3	Microcontroller	Rajkamal Pearsons
4	Microcontroller	Mazidi and Mazidi

#### SEMESTER I

Biotechnology Practical performed by students (UG Course)

- Quantitative Estimation of proteins by Biuret method
- Estimation of DNA by Diphenylamine method
- Estimation of RNA by Orcinol method
- Quantitative estimation of amino acids using Ninhydrin reaction.
- Demonstration, use and care of microbiological equipments.
- Preparation of media, sterilization and isolation of bacteria
- Demonstration of motility of Bacteria.
- Simple staining of bacteria
- Gram staining of Bacteria
- Endospore staining.
- Demonstration of starch hydrolysis by bacterial cultures
- Growth of fecal coliforms on selective media

#### SEMESTER II

- Qualitative Analysis of sugars and proteins.
- Quantitative estimation of sugars (Dinitrosalicylic acid method).
- Estimation of glucose by Benedict's quantitative method
- Quantitative estimation of proteins by Lowry's method.
- Isolation of urease and demonstration of its activity
- Assay of protease activity.
- Immobilization of enzymes / cells by entrapment in alginate gel
- Effect of temperature / pH on enzyme activity
- Isolation of pure culture by pour plate method
- Isolation of pure culture by streak plate method
- Antibiotic sensitivity assay.
- Oligodynamic action of metals.
- Stages of mitosis.
- Stages of meiosis.

#### SEMESTER III

• Spectrophotometric analysis of DNA denaturation.

• Determination of absorption spectrum of oxy- and deoxyhemoglobin and methemoglobin.

- Protein estimation by E280/E260 method.
- Paper chromatography of amino acids/sugars.
- TLC of sugars/amino acids.
- Estimation of Sugars by Folin Wu method
- Validity of Beer's law for colorimetric estimation of creatinine.
- Absorption spectrum of NAD & NADH
- Preparation of standard buffers and determination of pH of a solution
- Titration of a mixture of strong & weak acid

#### SEMESTER IV

• Antigen – antibody reaction – determination of Blood group

- Pregnancy test
- Widal test
- Ouchterloneyimmunodiffusion
- Radial immunodiffusion
- ELISA
- Paper electrophoresis of proteins
- Gel electrophoresis of proteins.
- SDS-PAGE of an oligomeric protein.
- Calculation of mean, median, and mode (manual/computer aided).
- Calculation of standard deviation and standard error (manual/computer aided).
- Biostatistical problem based on standard deviation.

#### SEMESTER V

- To measure concentration of DNA & RNA by UV spectrophotometry
- Estimation of proteins by Bradford method
- Isolation of genomic DNA.
- Isolation of Plasmid DNA.
- Restriction digestion of DNA.
- Demonstration of Replica plating technique
- Demonstration of Southern blotting

#### SEMESTER VI

- Establishing a plant cell culture (both in solid and liquid media) seed germination, callus culture, suspension cell culture, regeneration from callus cells.
- Anther culture, embryo culture, suspension culture.
- Cell count by hemocytometer.
- Cytology of callus.
- IMViC test.
- Determination of COD
- Testing of chlorine demand of water
- Determination of fecal coliforms by MPN technique/MF technique
- Isolation of azotobacter and rhizobium.
- Assay of amylase
- Determination of seed viability.
- Demonstration of Southern blotting
- Practical performed by students (PG Course) SEMESTER I (LAB 1)
- Cell motility and flagellar staining.
- Immobilization of enzymes (Invertase/ Protease/ Amylase.) by Na alginate method.
- Whole cell immobilization (Yeast) by Na Alginate and the estimation of alcohol
- produced.
- Effect of NaCl on amylase activity
- Effect of Temperature on activity of Amylase / Alkaline phosphatase and determination of optimum temperature.
- Effect of Substrate concentration on activity of Amylase / Alkaline phosphatase and determination of
- optimum substrate concentration.

• Effect of pH on activity of Amylase / Alkaline phosphatase and determination of optimum pH

- Isolation of chlorophyll and xanthophyll from spinach leaves
- Study of Mitosis and Meiosis
- Isolation, Purity determination and quantitation of DNA by UV method.

#### SEMESTER I (LAB 2)

• Separation of lipids / amino acids by thin layer chromatography

• Polyacrylamide gel electrophoresis: a) native enzyme preparation, b) SDS-PAGE of proteins.

• Introduction to measurements: balance and pipetting, preparation of solutions of given molarity and

• normality.

• Measurement of pH: buffering capacity, to determine pKa value and hence the dissociation constant of a given acid using pH meter.

• Colorimetry: To determine the dissociation constant of a given indicator colorimetrically and to prepare buffer solutions in the pH range 2.2 to 8.0

- Colorimetry: Assay of DNA by diphenylamine method.
- Colorimetry: Assay of RNA by orcinol method.

• Conductometry: Titration of strong acid vs strong base, to find out equivalent conductance of salt formed.

- Spectrophotometry: To study the absorption spectrum of hemoglobin and NADH
- The validity of beers law for colorimetric estimation of creatinine.
- The ultraviolet absorption of proteins and amino acids.
- Estimation of proteins by Lowry's and Bradford method.
- Estimation of protein by E280/E260 method.

#### Semester II LAB I

- Immobilization of cells/enzymes.
- Cleanliness, media preparation, sterilization, culturing methods, dilution techniques.

• Staining techniques in microbiology; simple staining, gram staining, spore staining capsule staining,

- flagella staining.
- Isolation of pure culture by different techniques.
- Replica plating technique.
- Demonstration of immunochemical reactions (blood group, Widal, VDRL, pregnancy,

ELISA)

- Blood film preparation and identification of cells.
- Ouchterlony immunodiffusion,
- Determination of albumin by radial immunodiffusion.
- Biochemical tests for identification of Bacteria Oxidase, catalase, IMViC test, etc.
- Isolation of antibiotic resistant bacteria from waste / sewage water.
- Motility of bacteria by hanging drop method.
- Assay of antibiotics by disc diffusion method.

#### Semester II LAB II

- Southern blotting.
- Isolation of genomic DNA.

• Endonuclease digestion of DNA and analysis of DNA fragments by agarose electrophoresis.

- Isolation of RNA.
- Restriction fragment length polymorphism.
- Isolation of plasmid DNA (miniprep and alkaline bulk method)
- Isolation of RNA
- Estimation of RNA by Orcinol method
- Estimation of DNA by diphenylamine method
- Estimation of DNA by E260 method

#### Semester III LAB I

- Recombinant DNA technology: in vitro DNA ligation and transformation of E. coli.
- Recombinant DNA technology: characterization of transformants.
- Agarose gel electrophoresis and restriction mapping of DNA.
- Demonstration of technique of PCR
- Replica plating technique.
- Endonuclease digestion of DNA and analysis of DNA fragments by agarose electrophoresis.
- Restriction fragment length polymorphism.
- Quantitation of DNA by various methods.
- Preparation of plant tissue culture media.
- Surface sterilization.
- Organ culture.
- Callus propagation, organogenesis, transfer of plants to soil.
- Protoplast isolation and culture.
- Anther culture: production of haploids.
- Cytological examination of regenerated plants.

#### LAB II (Core Elective A)

- Detection of coliforms for determination of the purity of potable water.
- Determination of total dissolved solids of water
- . Determination of Hardness and alkalinity of water sample.
- Determination of dissolved oxygen concentration of water sample
- Determination of biological oxygen demand of sewage sample
- Determination of chemical oxygen demand (COD) of sewage sample.
- Analysis of oligodynamic action.
- 10. Production of microbial fertilizers (Rhizobium, Azotobacter and AMF).

#### Semester IV LAB I

- Calculation of mean, mode, and median
- Calculation of standard deviation and standard error
- Using computer in single user and multiple user environment
- . Computer aided statistical analysis
- Computer presentation of statistical data, charts and diagrams
- Computer aided visualization of amino acid sequence of protein and its 3D structure.
- Retrieving metabolic pathway using internet
- Homology searching using BLAST

- Base sequence analysis of gene / protein sequence
- Computer aided survey of scientific literature

Environmental Biotechnology

- Test for the degradation of a aromatic hydrocarbons by bacteria
- Estimation of heavy metals in water/soil by Atomic absorption spectrophotometry,
- Estimation of nitrate in drinking water.
- Role of microorganisms in elevation of heavy metal induced stress in plants.
- In vitro evaluation of medicinal plants against pathogenic microbes.
- Study of patenting procedure
- Preparation of proposal for patenting.

#### **B.Sc. I PRACTICALS**

Practicals SemI

- 1. General concept of basic equipments and apparatus 2.Preparation of media and stains
- 3. Isolation of microbes from air, water, soil
- 4. Performance of simple Grams, acidfast and spores staining
- 5. Isolation of pure culture
- 6. Performance of slide culture technique and fungal staining
- 7. Performance of antibiosis
- 8. Performance of motility

#### Practicals Sem II

- 1. Enumeration of microbes by SPC method
- 2. Performance of oligo dyanamic action
- 3. Determination of phenol coefficient
- 4. Study the effect of salt on growth
- 5. To perform membrane filtration
- 6. To demonstrate the effect of radiation
- 7. To cultivate anaerobic bacteria
- 8. Demonstration of Micrometry

#### Practicals Semester III

- 1. Identification of carbohydrates and lipids
- 2. Detection of enzymes: amylase, catalase, gelatinase, lipase
- 3. Estimation of proteins
- 4. Estimation of DNA
- 5. Estimation of RNA
- 6. Production and estimation of alcohol
- 7. Isolation of amylase producer from soil
- 8. Leavening capacity of yeast
- 9. Immobilization of yeast and demonstration of invertase activity

Practicals Sem IV

1Isolation of organisms from water and sewage 2Determination of MPN 3IMViC Test

4Determination of DO, alcalinity 5MBRT, Phosphatase test 6,BOD and COD

- 7 Detection of arsenic by bioassay
- 8 determination of Chlorine demand Practicals

Semester v

- 1) Isolation of bacterial DNA
- 2) Isolation of plasmid DNA
- 3) Demonstration of restriction digestion
- 4) Estimation of creatinine by spectrophotometric method
- 5) Perform gelfiltration
- 6) Perform paper chromatography
- 7) Perform TLC
- 8) Identification of bacteria: E coli, S aureus, Salmonella, Proteus

Practicals Semester VI

- 1) Perform VDRL test
- 2) Perform Widal test
- 3) Perform immunodffusion
- 4) Perform Western blot
- 5) Perform PCR
- 6) Development of sphaeroplast
- 7) Production of biofertilizer
- 8) Production of soyasauce

#### SUBJECT CHEMISTRY

B.Sc. –I, Semester - I

CH-103: Laboratory Course

Practical- I(Inorganic Chemistry): Semi micro Qualitative Analysis

Qualitative analysis of inorganic salt mixture containing two acidic radicals of different group and two basic radicals of same groups. (At least six mixtures to be analysed) Practical- II (Physical Chemistry)

1) Determination of relative viscosity of unknown liquid by Ostwald viscometer.

2) To determine the percentage composition of given binary mixture (Ethanol-water) by viscosity method.

3) <sup>c</sup>Determination of surface tension of a given liquid by drop number method (Stalagmometer method)

4) Comparison of cleaning action of surfactants.

- 5) Determination of refractive index of given liquid by Abbe's refractometer.
- 6) Construction of various crystal models of NaCl unit cell.

7) To verify the Freundlich & Langmuir's adsorption isotherm of acetic acid on charcoal.

B.Sc. –I , Semester - II

CH-203: Laboratory Course Practical I (Organic Chemistry):

A) Qualitative Analysis: Element detection(N, Cl, Br, F & S),Identification of functional groups (-COOH, Phenolic –OH,\_-CHO, Aromatic -NH2, -CONH2),determination of M.P & B.P.

B) Preparation: i) Hydrolysis : Preparation of Benzoic acid from Benzamide

ii) Oxidation: Preparation of Benzoic acid from Benzaldehyde

iii) Bromination of Phenol

Practical II(Physical Chemistry):

1 To determine the heat of solution of potassium nitrate calorimetrically. 2 To determine the heat of ionization of acetic acid calorimetrically

3 To determine the solubility of benzoic acid at different temperatures and to determine heat of solution of benzoic acid.

4 To construct the phase diagram of three component system(Acetic acid-chloroformwater)

5. To determine the critical solution temperature of two partially miscible liquids(phenol-water systems).

6 To study the distribution of Iodine between Water and Carbon tetrachloride/Kerosene

7. To determine the strength of the given acid (HCL or CH3COOH) conductometrically using standard alkali solution.

8. To determine the specific reaction rate of the hydrolysis of methyl acetate catalyzed by H+ ions at room temperature.

9 .To dertermine the specific reaction rate of hydrolysis of ethyl acetate catalysed by base (saponification) 5

B.Sc. –II, Semester - III

CH- 303: Laboratory Course Practical-I (Inorganic Chemistry): Volumetric Analysis (All 5 Expts. to be performed)

Preparation of standard solution by weighing is compulsory

- 1) Estimation of Fe(II) by dichromate using internal indicator.
- 2) Determination of acetic acid in commercial vinegar using NaOH

- 3) Determination of alkali content in antacid tablet using HCl
- 4) Determination of Zn by complexometric titration with EDTA
- 5) Determination of total Hardness of water (permanent and Temporary ) by EDTA

Practical- II(Organic Chemistry):

Complete analysis of simple organic compound involving following steps :-

(i) Preliminary examination ii)Detection of elements iii)Detection of functional group iv)Determination of M.P. / B.P. v) Preparation of derivative and its M.P./B.P. vi)Performance of specific test if any

B.Sc. –II, Semester – IV CH-403: Laboratory Course Practical-I (Inorganic Chemistry):

- A) Gravimetric Analysis
- i) Estimation of Ba2+ as BaSO4,
- ii) Estimation Ni2+ as Ni-DMG

B) Chromatographic separation of binary mixtures(at least Two) containing Cu(II), Co(II) and Ni(II) ions by paper chromatography and determination of Rf values.

Practical-II ( Physical Chemistry):

1. To determine the strength of strong acid and a week acid in a given mixture conductometrically by titrating it with standard alkali solution.

2. To determine the solubility and solubility product of a sparingly soluble salt conductometrically.

3. To determine the ionization constant of weak acid conductometrically.

4. To titrate potentiometrically ferrous ammonium sulphate solution using potassium dichromate solution as

titrate and calculate the redox potential of Fe2+/Fe3+ system on hydrogen scale.

5. To determine the dissociation constant of weak acid potentiometrically by titrating it against alkali.

6. To determine heat of solution of solid calcium chloride and calculate lattice energy of calcium chloride

from its enthalpy change data using Born-Harber cycle.

7 .To determine the strength of given acid (HCL or CH3COOH) potentiometrically using standard alkali

solution

8. To determine the molecular state of Benzoic Acid by distribution method . 9

B.Sc. –III, Semester – V

CH-503: Laboratory Course Practical I (Organic Chemistry): Estimations i) Estimation of Glucose

ii) Estimation of Amide

- iii) Estimation of Nitro group
- iv) Estimation of Carboxylic group
- v) Saponification of oil

Practical II (Physical Chemistry):

1.To verify law of refraction for mixture (glycerol-water) using Abbe's refracto meter. 2.To determine the specific rotation of a given optically active compound.

3. To verify Beer-Lambert law for KMnO4 and determine the concentration of the given solution of KMnO4.

- 4. To determine molecular mass of a non-volatile solute by Rast method.
- 5. To determine the molecular weight of polymer by Viscometric method.

6. To determine the surface tension of methyl alcohol, ethyl alcohol & n-hexane at room temperature & also calculate atomic parachors of carbon, hydrogen & oxygen.

7. To determine the energy of activation of reaction between persulphate iodide .

8. To study the rate of acid catalysed iodination of acetone. 11

B.Sc. –III, Semester – VI CH-603: Laboratory Course Practical-I (Inorganic Chemistry):

A) Preparation of following complexes and Comments on its VBT structure, magnetic properties and colors

a) [Cu(NH3)4(H2O)2]SO4 b) [Ni(NH3)6]SO4 c) Trans [Co(NH3)4Cl2]Cl d) K3[Fe(C2O4)3].H2O

B) Colorimetery

i) Colorimetric or spectrophotometric estimation of copper (II) in commercial copper sulphate sample as ammonia complex.

ii) Jobs method of determination of composition of Fe- SSA complex

iii) Mole Ratio Method of determination of composition of Fe- SSA complex

Practical-II (Organic Chemistry):

Separation of an organic mixture containing two solid components using NaOH /NaHCO3 for separation , identification of the components and preparation of suitable derivatives (minimum five mixtures)

#### PHYSICS

B. Sc. First Year (Semester I) Course - Physics Practical (103)

 A student will have to perform at least ten experiments per semester and two experiments (from different fields) at the time of university practical examination in 6 hours.
 The distribution of practical/laboratory work of 30 marks is- Two experiments (9 Marks each) - 18 Marks

Record book - 06 Marks Viva Voce - 06 Marks

Total 30 Marks

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List of the experiments-

 Range and least count of Instruments, measurements using various instruments and error analysis (vernier caliper, screw gauge, traveling microscope, spectrometer etc.)
 Young's modulus by cantilever.

- 3. Young's modulus by bending of beam.
- 4. Young's modulus by vibrational method.
- 5. Modulus of rigidity by Torsional pendulum.
- 6. Modulus of rigidity by Maxwell's needle.
- 7. Determination of  $\eta$  by statical method.
- 8. To determine Coefficient of Viscosity of water by Poiseulle's method.
- 9. Surface tension of a liquid by Quincke's method.
- 10. Surface tension of a liquid by Jagers method.
- 11. Surface tension of a liquid by Capillary rise method.
- 12. To determine the moment of inertia of a body using torsion pendulum.
- 13. To determine the moment of inertia of a fly-wheel.
- 14. Measurement of Inductance by phasor diagram method.
- 15. Measurement of Capacitance by phasor diagram method.
- 16. To study charging and discharging of a condenser through a resistor R.
- 17. To study growth/decay of current in LR circuit.
- 18. Study of growth of current in CR Circuit using microammeter.

- 19. Frequency of A.C. Mains by sonometer.
- 20. Study of frequency response of series LCR circuit and determination of Q- factor.
- 21. Study of Transformer (parameters determination).
- 22. Verification of Kirchhoff's law, using electrical network.
- 23. To calculate low resistance by potentiometer.
- 24. Calibration of an ammeter by potentiometer.
- 25. Determination of dielectric constant of a solid.
- B. Sc. First Year (Semester II) Course Physics Practical (203)1. A student will have to perform at least ten experiments per semester and two
- experiments (from different fields) at the time of university practical examination in 6 hours.
- 2. The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 Marks each) - 18 Marks Record book - 06 Marks Viva Voce - 06 Marks

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Total 30 Marks

List of the experiments-

- 1. Acceleration due to gravity by compound pendulum.
- 2. To study damping of a bar pendulum.
- 3. To study oscillations of a rubber band and to draw potential energy curve for it.
- 4. To study the oscillation in a bifilar suspension arrangement.
- 5. To determine acceleration due to gravity by Kater's reversible pendulum.
- 6. Study of Lissajous's figure
- 7. To determine the pressure coefficient of air by constant volume air thermometer.
- 8. To verify the Stefan's law of radiation by using an incandescent lamp.
- 9. Thermal conductivity of a metal rod using Forbes method.
- 10. Thermal conductivity of a bad conductor by Lee's disc method.
- 11. To determine the critical temperature and critical pressure of a gas.
- 12. To determine the coefficient of thermal conductivity of glass in the form of a tube.

13. To determine specific heat of a given liquid by method of cooling.

14. To find Y ratio of specific heat of gas by Clamert and Desormi's method.

15. Mechanical equivalent of heat by Calender- Barne's constant flow method.

16. To determine the mechanical equivalent of heat (J) with the help of Joule's calorimeter.

17. To determine temperature coefficient of resistance of platinum using platinum resistance thermometer

18. Study of heating efficiency of electrical kettle with varying voltages.

19. To study the variation of total thermal radiation with temperature using the torch bulb filament.

20. To determine height of a building, altitude of sun and angular diameter of sun with the help of a sextant.

21. To determine the horizontal component of Earth's magnetic field and magnetic moment of the magnet.

22. To study the variation of magnetic field along the axis of a current carrying circular coil.

23. Study of magnetic field by vibration magnetometer.

24. To determine the dipole moment of a given liquid.

25. To determine magnetic susceptibility of FeCl3.

- B. Sc. Second Year (Semester III) Course Physics Practical (303)
- 1. A student will have to perform at least ten experiments per semester and two

experiments (from different fields) at the time of university practical examination in 6 hours.

2. The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 Marks each) - 18 Marks Record book - 06 Marks Viva Voce - 06 Marks

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Total 30 Marks

List of the experiments-

- 1. Study the speed of waves on stretched string.
- 2. Determination of velocity of sound using volume resonator.

3. To determine frequency of A. C. Mains with a Sonometer using single/two magnetic wire.

4. To determine unknown frequency and to verify the law of inverse variation of frequency and volume of air by Helmholtz resonator.

5. To determine the velocity of sound wave in air (gas) with Kundt's tube.

6. To determine the radius of curvature of the lower surface of a plano-convex lens by using Newton's ring apparatus.

7. Study of wavelength of light using Newton's ring.

8. To study the variation of the fine width with color of light.

9. To study the characteristics of micro phone.Study of loudspeaker (woofer, squawker, tweeter) as a transducer.

10. Study of Piezoelectric effect.

11. To Study the current regulation and ripple factor of half wave / full wave rectifier using semiconductor diodes with L and  $\Pi$  type filter.

12. To study the characteristics of zener diode.

13. To study the zener diode voltage regulating characteristics.

14. To study the regulation characteristics of zener regulated and IC 741 regulated power supply.

15. To determine the velocity of ultrasonic waves in a given liquid.

16. To produce interference pattern using Lloyd's mirror and to determine the wavelength of sodium light.

17. To determine the dispersive power of a prism.

18. Study of polarization of light by reflection (Brewster's law).

19. To find R.I. of glass by using Brewster's law. To determine the resolving power of a grating.

21. To study diffraction at straight edge and to determine the wavelength of monochromatic light.

22. To determine the resolving power of a telescope.

23. Study of wavelength of light using plane diffraction grating.

24. To determine the wavelength of prominent lines of mercury by plane transmission grating.

B. Sc. Second Year (Semester IV) Course - Physics Practical (403)

 A student will have to perform at least ten experiments per semester and two experiments (from different fields) at the time of university practical examination in 6 hours.
 The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 Marks each) - 18 Marks Record book - 06 Marks Viva Voce - 06 Marks

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Total 30 Marks

List of the experiments-

1. To determine wavelength of LASER beam using plane diffraction grating or cylindrical obstacle.

- 2. To study the divergence of a LASER beam.
- 3. To study LASER as a monochromatic coherent source.
- 4. Study of total internal reflection using LASER.
- 5. Measurement of the focal length of a given convex lens using LASER.
- 6. Goniometric study of crystal faces using models.
- 7. To construct SC, BCC, FCC and to find packing fraction, coordination number.

8. To determine lattice parameter 'a' of a unit cell of a cubic crystal using X-ray diffraction film.

9. To determine the energy gap of a semiconductor using four probe method.

10. To determine energy gap of a semiconductor using PN junction diode in reverse bias mode.

11. To determine the dielectric constant of a solid and its polarisability by resonance method.

- 12. Study of IR Spectra of HCl molecule.
- 13. Identification of unknown element from line emission spectra.
- 14. To determine the Rydberg constant for Hydrogen.
- 15. Study of characteristics of LED.
- 16. To study the characteristics of photo diode and use as light sensor (LDR).
- 17. Study of Solar cell as a Photo voltaic cell.

18. Study of characteristics of transistor in common base mode.

19. Study of characteristics of transistor in common emitter mode.

20. To study the variation of gain with frequency of single stage common emitter amplifier.

21. To study the frequency response of a single stage transformer coupled transistor amplifier.

22. To study variation of gain of CE amplifier with load at fixed frequency.

23. Study of characteristics of field effect transistor.

24. Study of FET as an amplifier.

25. To determine the Hybrid parameters of a transistor.

B. Sc. Final Year (Semester V) Course - Physics Practical (503)

1. A student will have to perform at least ten experiments per semester and two experiments

(from different fields) at the time of university practical examination in 6 hours.

2. The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 Marks each) - 18 Marks Record book - 06 Marks Viva Voce - 06 Marks

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Total 30 Marks

List of the experiments-

1. To study the absorption spectra of iodine vapour and to determine its dissociation energy and force constant.

2. To estimate the temperature of sodium flame by studying the reversal of the spectral lines (D-line).

3. To determine the electric charge of an electron by Millikan's oil drop method.

4. To determine the value of e/m of an electron by Busch's helical beam method.

5. To determine the value of e/m of an electron by Thomson method.

6. To determine electronic charge and work function of the cathode material using photocell.

7. To determine the plank's constant 'h' by vacuum type photocell using DPMS.

8. To determine Planck's constant by photo cell.

9. To determine Planck's constant by solar cell.

10. To determine Hall coefficient and mobility of charge carriers in a semiconductor.

11. To verify the laws of probability distribution throwing one coin, two coins and ten coins.

12. Study of statistical distribution from the given data and to find most probable, average value and RMS value.

13. Study of random decay of nuclear disintegration and determination of decay constant using one colored face dices.

14. To show that deviation of probability of an event from theoretical value decreases with increase in number of events.

15. Determination of average grain size of a particle from X-Ray diffraction spectra using Debye- Scherrer Formula.

16. Study of particle size of nano particles by SEM /TEM method.

17. Determination of size of nano particles by particle analyzer (BET).

18. To determine the transmission coefficient of a transmitting plate using photometer.

19. To determine the electro-chemical equivalent of hydrogen using Hoffman's tube.

20. To measure A. C. / D. C. voltage using a C. R. O. and to calculate it's deflection sensitivity.

21. To determine the unknown frequency /to compare the frequency of two unknown signals using C. R. O.\

22. To study and trace different wave forms of oscillator using C. R. O.\

23. Measurement of thermo emf.

1.

24. To determine the concentration of sugar solution by half shade polarimeter.

25. Measurement of global and diffuse radiation using pyranometer.

B. Sc. Final Year (Semester VI) Course - Physics Practical (603)

A student will have to perform at least ten experiments per semester and two

experiments (from different fields) at the time of university practical examination in 6 hours.

2. The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 Marks each) - 18 Marks Record book - 06 Marks Viva Voce - 06 Marks -----

#### Total 30 Marks

List of the experiments-

- 1. To draw the histogram of theoretical Gaussian curve.
- 2. Recording and analysis of ECG Signals.
- 3. Verification of Beer's- Lambert's law.
- 4. To determine pH value of Amino acids.
- 5. Measurement of BP and recording of Kortov sound.
- 6. Measurement of body temperature using GSR and thermister probe.
- 7. Measurement of skin resistance using GSR.
- 8. To draw the plateau curve of a given Geiger Mueller counter
- 9. Study of Op. Amp. as an Inverting and Non Inverting amplifier.
- 10. Study of Op. Amp. as an Adder and Subtractor.
- 11. Study of Op. Amp. as an Integrator and differentiator.
- 12. To construct and study the working of a phase shift oscillator.
- 13. Study of Hartley Oscillators.
- 14. Study of Colpitts Oscillators.
- 15. Study of Amplitude modulation.
- 16. Study of diode as an AM detector.
- 17. Study of diode as clipper, clamper and voltage doublers.
- 19. Study of Frequency modulation using IC.
- 20. Study of F M detector using IC.
- 21. Study of basic gates (AND, OR, NOT)
- 22. Study of logic gates (using IC) and verification of De Morgan's theorem.
- 23. To study the characteristics of NAND/NOR gate and its use as a universal gate.
- 24. Verification of laws of Boolean algebra using NAND gate.
- 25. Study of Ex- OR gate as a half adder and full adder.
- 26. Study of Ex- OR gate as a half subtractor and full subtractor.

B. Sc. Semester - I Practical List

B. Sc. I ELECTRONICS PRACTICAL Semester 1 Section A

A1. Study of laws of series resistor and application as voltage divider. A2. Study of laws of parallel resistor and application as current divider. A3. Study of battery as practical (i) voltage source (ii) current source.

- A4. Study of maximum power transfer.
- A5. Study of Forward Bias characteristics of diode. (PN & LED)
- A6. Study of Reverse Bias characteristics of ZENER diode.
- A7. Study of Characteristics of BJT. (Input, Output, Transfer Characteristics)
- A8. Verification of Norton's Theorem.
- A9. Verification of Thevenins Theorem.

#### B. Sc. I ELECTRONICS PRACTICAL Semester 1 Section B

- B1. Study of basic logic gates.
- B2. Study of NAND as universal gate.
- B3. Study of NOR as universal gate.
- B4. Verification of Demorgan's Theorem.
- B5. Simplification of logic expressions using Boolean algebra.

B6. Study of binary to gray code converter using K map. B7. Study of gray to binary code converter using K map. B8. Study of Multiplexer using gates.

- B9. Study of De-Multiplexer using gates.
- B10. Study of Multiplexer using IC.
- B11. Construction and study of half adder and full adder.
- B12. Construction and study of half subtractor and full subtractor.
- B13. Verification of Boolean laws & Verification of duality theorem.

#### B. Sc. SEM - II Practical Paper - I

- 1 Study of JFET characteristics.
- 2 Study of MOSFET characteristics.
- 3 Study of SCR characteristics.
- 4 Study of DIAC characteristics.
- 5 Study of UJT characteristics.
- 6 Study of UJT as relaxation oscillator.
- 7 Study of Transistor as a switch.
- 8 Study of transistor as voltage amplifier using CRO.
- 9 Study of class A power amplifier.
- 10 Study of TRIAC characteristics.
- 11 Study of Band width in single stage amplifier.
- 12 Study of complementary symmetry power amplifier.
- :

#### Paper – II

- 1 Switching characteristics of NOR.
- 2 Switching characteristics of NAND.
- 3 Study of RS Flip Flop using NAND/NOR gate.
- 4 Study of clocked RS Flip Flop using NAND/NOR gate.
- 5 Study of D Flip Flop using NAND/NOR gate.
- 6 Study of JK MS FF.

- 7 Construction and study of decade counter.
- 8 Study of mod-counter.
- 9 Study of ring counter.
- 10 Study of Johnson counter.
- 11 Study of SISO register.
- 12 Study of SIPO register.
- 13 Study of PISO register.
- 14 Study of PIPO register.
- 15 Construction and study of synchronous counter.

#### B. Sc. SEM – III Practical Paper – I

- 1 Study of Op-amp as inverting and sign changer amplifier.
- 2 Study of Op-amp as Non-inverting and unity gain amplifier.
- 3 Op-amp as adder and averaging amplifier.
- 4 Op-amp as difference amplifier. (Subtractor)
- 5 Op-amp as integrator.
- 6 Op-amp as Differentiator
- 7 Op-amp as comparator and zero crossing detector.
- 8 Op-amp as Schmitt trigger.
- 9 Study of Half wave rectifier.
- 10 Study of Full wave rectifier.
- 11 Study of Full wave Bridge rectifier.
- 12 Study of Zener regulator.
- 13 Regulated P.S. using series pass transistor.
- 14 Study of LM-317 (variable regulator)
- 15 Study of 78XX
- 16 Study of 79XX
- 17 Study of difference using transistors.

Paper – II

- 1 Study transient & AC analysis of RC circuit
- 2 Study transient & AC analysis of different OP-Amp as
- comparator

3 Study transient & AC analysis of different OP-Amp as inverting amplifier

- 4 Study transient & AC analysis of different OP-Amp as IA
- 5 Study CE amplifier parameters
- 6 Study CB amplifier parameters
- 7 Study CD FET amplifier parameters
- 8 Study of MOSFET Characteristics
- 9 Study of Low Pass Filter
- 10 Study of VI for Function Generator
- 11 Study of VI for Display(CRO)
- 12 Study of Average / Running average VI

#### B. Sc. SEM – IV Practical Paper I

- 1 Study of OP-amp based Wein bridge oscillator.
- 2 Study of OP-amp based Phase shift oscillator.
- 3 Study of Colpitt's oscillator.
- 4 Study of Op-amp as astable multi vibrator.

- 5 Study of Op-amp as Mono stable multi vibrator.
- 6 Study of Instrumentation amplifier.
- 7 Study of successive approximation ADC.
- 8 Study of Flash type ADC.
- 9 Study of Single slope ADC.
- 10 Study of Dual slope ADC.
- 11 Study of Binary weighted DAC.
- 12 Study of ladder type DAC
- 13 Study of NOT gate based crystal oscillator.
- 14 Study of Sample and hold circuit.

Paper – II

- 1 Study transfer characteristics of NTC type thermister
- 2 Study resolution in characteristics of NTC type thermister
- 3 Study transfer characteristics of LM 35
- 4 Study transfer characteristics of Water heater (around 300W)
- 5 Study of ON/ OFF type thermo-state using LM 35
- 6 Study transfer characteristics of LDR
- 7 Study transfer characteristics of Piezo-electric transducer
- 8 Comparative study of accuracy in 3 <sup>1</sup>/<sub>2</sub> digit, 4 <sup>1</sup>/<sub>2</sub> digit

5 <sup>1</sup>/<sub>2</sub> digit Multimeters

- 9 Directivity study of carbon Mic.
- 10 "Look up table" based o/p using microcontroller

B. Sc. SEM – V Practical Paper – I

- 1 Study of Half duplex communication system using PC/ $\mu$ C (2 wire interface)
- 2 Study of Full duplex communication system using  $PC/\mu C$  (3 wire interface)
- 3 ASK using op-Amp
- 4 FSK using op-Amp
- 5 Study of AM detector
- 6 Study of narrow band amplifier using op-amp/ Transistor
- 7 Study of intensity characteristics of LASER diode
- 8 X-bee interface using PC/  $\mu$ C / field strength study
- 9 IR Link study
- 10 Wire impedance measurement

Paper – II

B1. Write an Assembly Language Program for addition of two numbers which is stored in register.

B2. Write an Assembly Language Program for addition of two numbers which is stored in memory location.

B3. Write an Assembly Language Program for subtraction of two numbers which is stored in register.

B4. Write an Assembly Language Program for subtraction of two numbers which is stored in memory location.

B5. Write an Assembly Language Program for 2's complement of given number which is stored in memory

location and result also store in memory location

B6. Write an Assembly Language Program for addition of five numbers which is stored at memory location from

7500H to 7504H and result store in 7505H & carry store in 7506H

B7. Write an Assembly Language Program for multiplication of two numbers which is stored in memory location.

B8. Write an Assembly Language Program for evaluate equation  $y = u \ x \ v + p \ x \ q + r \ x \ s$  where u, p, r, v, q & s

are stored in memory location 7500H onwards and result store in next location. (Using Subroutine)

B9. Write an Assembly Language Program to division of any two numbers which is stored in memory location.

B10. Write an Assembly Language Program to find 1's complement of any number with one CMA instruction.

B11. Write an Assembly Language Program to move the number 5FH to register C & then the number is move to all other register & also the memory location 7500H

B. Sc. SEM – VI Practical Paper – I

1. Write an Assembly Language Program for blinking 8 LEDs interface with Port 1 of microcontroller in common anode mode.

2. Write an Assembly Language Program for counter (0 to 9) on single Seven Segment Display interface with Port 1 of microcontroller in common anode mode.

3. Write an Assembly Language Program for counter (0 to 9) using lookup table on single Seven Segment Display interface with Port 1 of microcontroller in common anode mode.

4. Write an Assembly Language Program for display any three characters on alphanumeric LCD (16 x 2) in 8 bit mode interface with Port 1 and Port 2 of microcontroller.
5. Write an Assembly Language Program for interfacing 4 keys interface with Port 2 which is indication on LEDs interface on Port 1 of microcontroller.

6. Write an Assembly Language Program for relay interfacing with microcontroller.

7. Write an Assembly Language Program for generating serial communication between computer and microcontroller using UART (RS232 protocol). (use 9600 baud rate)

8. Write an Assembly Language Program for DC Motor interface with any port pins of microcontroller 8051 for forward and reverse rotation after interval 3 seconds.

9. Write an Assembly Language Program for Stepper Motor interface with any port pins of microcontroller 8051 for forward and reverse rotation after interval 3 seconds.

10. Write an Assembly Language Program for blinking 8 LEDs interface with Port 0 of microcontroller 8051 in common cathode mode by using Timer 0 as delay.

Paper – II

1) WAP in c to fine a Result and Grade of student from five different paper are input through key board. The students get division as per following rules.

a) % > or = 60, then first division

b) 50 < % < 59, then second division

c) 40 < % < 49, then third division

d) % < 40, then fail

- 2) WAP to display a table from 1 to 100.
- 3) WAP to find a given number is Prime or Not.
- 4) WAP generate a delay using function delay().
- 5) WAP in c to calculate a factorial of a given number using recursion.
- 6) WAP using goto statement.
- 7) WAP using continue statement.
- 8) WAP to find a square root of given number.
- 9) WAP to find ASCII values of any alphabets.
- 10) WAP to find a power of given number.
- 11) WAP to generate a series as 0, 1, 2, 4, 8, 16, ....
- 12) WAP to generate a series as 1, 1, 2, 3, 5, 8, 13, 21, ...
- 13) WAP to find an addition using call by value.
- 14) WAP to find area and perimeter using call by reference.
- 15) WAP to print out the memory location in which the elements of array are store.



#### UNIVERSITY GRANTS COMMISSION BAHADUR SHAH ZAFAR MARG NEW DELHI-110002.

#### No.F.0-24/97 (CPP-I)

January, 1999.

The Registrar, Nagpur University, Nagpur-440 Olo (Maharashtra).

2 9 JAN 1999

Sub: List of colleges prepared under Section-2(f) of the UGC Act, 1956-Inclusion of New Colleges,

Sir,

I am directed to refer to letter dated 12-12-98 of Kamla Nehru Mahavidyalaya forwarded by the University on the above subject and to say that the name of the following college has been included in the above list under Non-Government college teaching upto Bachelor's Degree :

Name of the College	Year of Estt.	- Remarks
Kamla Nehru Mahavidyalaya, Nagpur.	June,1983	The College is eligible to receive central
( Dr. Smt. S.G. Wanjari )	10	of the rules framed

The Indemnity Bond and other documents in respect of the above college: ' have been accepted by the Commission.

Yours faithfully,

of the UGC Act, 1956.

Char ( D.D. Mehta ) Under Secretary

#### Copy forwarded to:-

1. The Principal, Kamla Nehru Mahavidyalaya, Sakardara Cowk Magpur, The Secretary, Govt. of India, Ministry of Human Resource Development, Deptt. of Education, T-14 Section, New Delhi.
3. Joint Sacretary, UGC Western Regional Office, Ganeshkhind, Pune University Campus, Pune-411 007.
4. All Sections, UGC.
5. Section Officer, (FD-III Section) UGC, New Delhi.
6. D.T.P. Cell, UGC.
7. Guard file.

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क्र-नाविसं २००३/८ १० /८३ //मशि ३ उच्च व तंत्र शिक्षण विभाग मंत्रालय विस्तार भवन, मुंबई-४०० ०३ २ दिनांकं :- २७ मे, २००३.

### प्रति, कुलसचिंव, नागपूर विद्यापीठ, नागपूर

### विषयः - सन २००३-२००४ या शैक्षणिक वर्षापासून संलग्नित महाविद्यालयांच्या विस्तारास झासन मंजूरी देण्वाबाबत.

संदर्भः - संचालक, उच्च शिक्षण, महाराष्ट्र राज्य, पुणे यांचे क्र. अमवि-२००३-०४/ नअतु/ मान्यता/ मवि-३, दि. १६.४.२००३.

महोदय,

संदर्भाधीन पत्रान्वये शासनास केलेला प्रस्ताव विचारात वेऊन आपल्या विद्यापीठाच्या अखल्यारितील सोबत जोडलेल्या यादीतील महाविद्यालयांना त्यांच्या नावासमोर दर्शविलेले अभ्यासक्रम/ विषय/ तुकड्या सुरु करण्यास सन २००३-२००४ पासून महाराष्ट्र विद्यापीठ कायण. १९९४ च्या कलम ८३(५) अन्वयं सदर महाविद्यालयांना उपरोक्त अभ्यासक्रम /विषय/ तुकड्या चालविण्यास संस्थेने भविष्यात अनुदानांची दिवा आर्थिक मदतीची मागणी करणार नाही अशा आशयाचे हमीपत्र सहसंचालक, उच्च शिक्षण नागपूर विभाग. नागपूर यांना सादर करण्याच्या अटीवर कायम विना अनुदान तत्वावर शासनाची मंजूरी देण्यात येत आहे. २. विद्यापीठाने संलग्नीकरण देण्याबाबत आवश्यक असलेली पुढील कार्यवाही करुन पूर्तता अहवाल संचालक, उच्च शिक्षण, महाराष्ट्र राज्य, पुणे व संबंधित विभागीय सहसंचालक, उच्च शिक्षण यांना कृपया पाठवावा.

आपली विश्वासू,

SINSIZAMINA

(अं. अ. कारखानीस) अवर सविव, महाराष्ट्र शासन

प्रत,

संचालक, उच्च शिक्षण, महाराष्ट्र राज्य, पुणे सहसंचालक, उच्च शिक्षण, नागपूर विभाग, नागपूर. प्रानार्य, संबंधित संस्था ( देख्दनंन्टराट्य क्र , कराइरपूट व्यान्तव्याप्रवट्ट) ित्यास्ती - मशि- ३ С\WINDOWS\DESKTOP\Mathin3\Grantersdec

> Kamierishru Mahavidyalara Taideardara Chowik, Nagper

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### नागपूर विद्यापीठ नागपूर.

शासन पत्र क्रमांक- नाविसं- २००३/(१०/०३)/ गशि ३.दि. २७.५.२००३अन्वय सन २००३-२००४ या शैक्षणिक वर्षापासून विषय (अव्यावसायिक)

सरु करण्यास शासनाने मंजरी दिलेल्या महाविद्यालयांनी यादी.

	get to all the state	निराणाता	गंजर केलेले विषय
अ.क्र.	महाविद्यालयाच नाव	विधाराखा	
۶.	कमला नेहरु महाविद्यालय, सक्करदरा.	विज्ञान	
	नागपूर		१) प्राणाशास्त्र -
		. ^	२) वनस्पताशास्त्र
			३) बायोंकमेस्ट्री
			४० मायकोबॉयॉलॉर्जा
	िन्न्मेंग सॅन्देज नागएर	कला	एम.ए. अर्धशास्त्र
<u> </u>	हिस्लाप कोलेज , नानपूर	कला	१) एम.ए. भगती
3.	सत गाडग महाराज महाविधालय, खगजा,	>	२) एम.ए. समाजशास्त्र
	जि. नागपूर		<ol> <li>एम.ए. अर्थशास्त्र</li> </ol>
		त्राणित्य	४) एम कॉम
		911009 	<ol> <li>) ती ए. भग-? इंग्रजी वादमय</li> </ol>
۲.	बॅरिस्टर शेषराव वानखेडे कॉलेज ऑफ	केली	
	आर्टस् ॲण्ड कॉमर्स खापरखेडा . जि.		
	नागपूर		<u>के से स्टॉग के इंग्रेसी माध्यम</u>
4	सेठ केसरीमल पोरवाल कॉलेज, कामले.	वाणज्य	्र) भाषा (जमानसाम्स)
	जि. नागपूर	कर्ता	
		[तज्ञान	२) ता प्रयो (भौतिकणाम्न)
			<ol> <li>स्व.एस्स.(नातनम्बारन)</li> <li>स्व.एस्स.(नातनम्बारन)</li> </ol>
			५) एम.एस्स (मायक्राबायालाजा)
E	राजंद्रसिंह बाबा व्यास आर्ट ॲण्ड कॉमर्स	कला	१) बा.ए. इंग्रजी वाङमय
	कॉलेज, कोंढाळी, जि. नागपूर		२) एम.ए. मराठा
			३) एम.ए. समाजशास्त्र
5	भालेराव सायन्स कॉलेज सावनेर, जि	विज्ञान	बॅचलर ऑफ कॉम्प्युटर सायन्स
	नागपर		
	जी एस कॉलेज ऑफ कॉमर्स, वर्धा	वाणिज्य	बी.कॉम. कॉम्प्युटर ॲप्लिकेशन
	रार्यम ऑग्ड सायन्स कॉलेज, प्लगांव,	कला	एम.ए.भाग-१ भूगोल
9	आटत् जण्ड साम संगण उ		
	ाजा.पथा	कला	१) बी.ए. भाग-१,२ व ३ साठी इंग्रजी
8	• आटस्, कामस अण्ड सामर माराजा		वाङमय
	त्कम, जि. चंद्रपूर.		and the second s

## नागपुर विद्यापीठ नागपुर.

शासन पत्र क्रगांक- नाविसं- २००३/(१०/०३)/ मशि ३,दि. २७.५.२००३३०वय सन २००३-२००४ या शैक्षणिक वर्षापासून- विषय (व्यावसायिक)- सुरु करण्यास शासनाने मंजूरी दिलेल्या महाविद्यालयांची यादी.

3	न.क्र.	महाविद्यालयाचे नाव	विद्याशाखा	मंजूर केलेले निषय
8	<.	कमला नेहरु महाविद्यालय, सक्करदरा,	विज्ञान	१) बी.एस्सी. वायोटेक्नॉलॉजी ५
	-	नागपूर		२) बी.टेक ॲप्लाईड
				इलेक्टॉनिवरा
			समाज विज्ञान	मांस्टर ऑफ लेवर स्टडीज
1	२.	सेंट्रल इन्स्टिटयूट ऑफ बिझनेस मॅनेजमेंट	वाणिज्य.	१) बॅचलर ऑफ कॉमर्स
		रिसर्च डेव्हल्पमेंट, नागपूर		(कॉम्प्युटर ॲप्लिकेशन)
				२) बॅचलर ऑफ मास
				कम्युनिकेशन
	3.	श्री. बिंझाणी सिटी कॉलेज, उमरेड रोड,	वाणिज्य	बॅनलर ऑफ कॉमर्स (कॉम्प्युटर
		नागपूर		ॲफ्लिकेशन)
ſ	۲.	हिस्लॉप कॉलेज , नागपूर	वाणिज्य	मारटर ऑफ कॉम्प्युटर
				र्मनेजभें <i>ट</i>
,	4.	कै.के. इंड एन. सायन्स कॉलेज ब्राम्हणी,	विज्ञान	पोस्ट ग्रॅज्युप्ट डिप्लोमा इन
		ता. कळमेश्वर, जि. नागपूर	,	कॉम्प्युटर सायन्स अण्ड
				अंग्लिकशन
	٩.	भालेराव विज्ञान महाविद्यालय, सावनेर	विज्ञान	गोरट ग्रेज्युएट डिप्लामा इन
	• k			कोम्प्युटर कमाशयल ऑफिजेन्स्टर
	10	210-22		आप्लकशन
		आग्नहोत्री कलिज आफ लायब्ररी अण्ड इन्होंग्रिया गामन्त्र जार्न	মূচাবরান	<ol> <li>भा.टक. (३लक्ट्रानिक्स ऑग्लाईन)</li> </ol>
		रम्पगनरने सायन्स, वध		अल्लार्स्ड) २) सॅसलप ऑफ स्ट्रेनिजन
				र) भगरार आफ स्टारपर हिंद्वाईन
	-	जी एस कॉलेज ऑफ नॉफर्ट ज्यूरी	वाणिज्य	र्वतलर ऑफ कॉमर्स कॉफ्सरूर
	0.	आ. रत. माराज जाक कामस , वंधा		अंप्लिकशन
	2	आर्टस सायन्स कॉलेज, पलगांव जि वर्धा	वाणिज्य	<ol> <li>דוווג גווייייייייייייייייייייייייייייייי</li></ol>
				मॅनेजमेंट
			विज्ञान	२) पोस्ट ग्रॅज्यपट डिप्लोमा इन
				कॉम्प्युटर कमर्शियल
				अप्लिकेशन
			the second effects associated by a determinant of the balance ba	

PAL Kamle Noins Mahavidyalaga Sakkerdare Chowk, Nemper
# NAGPUR UNIVERSITY

#### NOTIFICATION

No.NM/Per-Aff/ /2-Dated the 24 June, 1998.

It is notified for general information of all concerned that, the following colleges affiliated to Cappur University, have been accorded permanent affiliation in the faculties and subjects mentioned against their name :-

<u>s.No</u>	Namr of the Collage	Faculty	Courses/Subjects	Date of approval of the report by Academic Council 5.
1	2.	3.		00-10
1.	J.B. College of Science, Mardna.	Faculty of Science (Eor B.Sc. Classes)	Comp.Narathi,Comp. Inglish,Supp.English Comp.Hindi,Physics Chemistry,Fathematic Sotany,Coology, Microbiology, Alectronics.	29th November, 1997.
2.	Yeshwant Haha- vidyalaya, eloo	Faculty of arts (for B.A. Classes)	Comp.Marathi, Comp. English, Marathi Litt. Political Science, Zoonomics, History, Home-Economics.	29th Nov., 1997.
з.	Samarth Maha- vidyalaya,Lakhar	i)Faculty of Arts (For B.A. Classes)	Comp.English, Comp.Narathi, Marathi Litt. Sociology, Politica Science, Economics, History.	29th Nov., 1997.
		ii) <u>Faculty of</u> Commerce (For B.Com. Classes)	Comp.English, Comp. Marathi, Financial A/C Paper-I,II,III, Economics/ Monetary Economics & Economi Flanning, Business Pro. & Practice, Business Mana. & Ac Cost Accounting, Mercontile & Indust Law, office Manager & Administration, Business Maths & St Management of Human Resources, Taxation Accounting.	dmn. trial ment tat. n
2		Baitkardara Chowk, N.S.		

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	<sup>ین</sup> و انکو این ایک ایک در ا	و الوجد وجومت وستو مدولت و در وحد و شو مغو	
	······································	4	5.
2.	و ان و معرو معرو سار سار سار ما ان	ومتوجيق وتجويدوا والواس والعوامين متوامين	
abira Maha- nidyalaya, Katol.	i) Faculty of Commerce (For B.Com. Classes)	Comp.English Comp. Marath Econumics, Actounts & Statistics, Conmerce, Business Management. & Business Management.	1 29th Nov., 1997.
	ii) Faculty of Arts (For B.A. Classes)	English, Marathi, Marathi English Litt., Economics, History, Political Science Home-Economics.	Litt.,
	iii) Faculty Of Science (For B.Sc. Classes)	Comp. English, Comp. Marath Physics, Chemistry, Zoology, Botany, Electronics, Mathematics.	11,
Kamla Nehru Mahavidyala Sakkardara, Nagpur.	i) Faculty of Arts (For B.A.I, II,III)	English, Marathi, Political Science, Sociology, Economi History, Home-Economics, Marathi Litt. English Lit	29th ics, Nov., 1997. t.
	ii) Faculty of Commerce a) B. Com.I class only	Comp. English, other Indian Languages-a) Marathi b) Supp. English only, Financial Accounting, Principles of Economics Business Procedure & Prac Business Management & Adm Optional Paper Group-H on	n tice, n. ly.
E Norman States Norman States	b) B.Com.II Class only	English, Other Indian Languages a) Marathi, b) Supp. English only. Financial Accounting Monetary Economics, Offic Management & Administrati Business Maths & Stats. Optional Paper Group-H-or	e on hly.
х Г	c) B.Com.III Class only	Auditing, Mercantile & Industrial Law, Economics Planning Development in India, Financial Account Management of Human Reso Optional Paper- GP-H-Onl	s ing, urces, Y.
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#### महाराषट् ं शासन

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व्याकः स्मजीती-२५८२/ १८५५ /िंड जिन २ जिमाद तेवानोदन विभाग, मंत्रालत ेवरता र भवन, सुंख्य-४०० ०२२ ८ इन, १९८९ दिनातः

प्रति,

क्लमचित, नानपूर विरागीत. नागपूर.

रितका := ११८२−२० रा केथीलच द्र्याणासून मवीन े∽ा शासा क्षत्र रसनास परतानमी केनावाजा.

गहोडिय,

१९८९-९० गा तगाँगासून न्तीन दिना जाता हरू टरावात शालनाव्हे वि<mark>यागी ठा</mark>ल्डून आहेल्या ीध्यारशीला विवार वस्त्र व्यता नेहरू प्रदा<sup>8</sup> २ -२ नागपूर था महावितालगाया १९४९-२० प्राहून खोली स्पूर हेताप्रमाणे नहीत हे. रागआ उक्ता राती राती काली का अर्जावर महाराष्ट्र ियामें ट अधीम्यन १९७४ जा राज ५२(४) व (५) अन्वये पृष्टील कार्यवाही करण्याकी दिलाणीठात प्रशासनी जेता योश शाल्नाने ठरोको आहे.

		महाविशालयाचे नाव	िव्यासाता	4
	त्रज्ञा -	हर महा विदालस, नाग्यूर	ेत जगम	
<b>·</b>	- 1 <b>1</b>	शास्नाने ज्लाग्नी हरणालरी ता	वर किले परवानने ही उत्ते	
अटीवरच	आहे :-		and the second second second	
9•		शासनावेद्वन तर जन्द आत का हेल्हात रेनार नाही •	CLU DE LANDON GERNE SPELIE	
२•		ती दिगाताता उग्हणगानी श्वरातारोच्या जिल्लीय पत्रा	गरवानाणे जेलगात आलेती अगो एज ियारी शेल्या योजन्त्रा तवाणिता वि प्राचेच शेल्ला अगोजनामी केन्द्र के	- m-1
		त्रात व्या ३० विता ही वि महावित त्रय तो वर्ग १९८९-९० गात् बोबीलक वर्गाच्या घेवटी होने क्मीत क्यी ३० वितासी हा	अगभी तेल्या तमीत तमी २० २वी इन हेरे वरावा तसेव १९८९-९० वि गिन्गा प्रथम धर्माच्या तिगागीठ वरी ले या हिलेत• (आदिवासी विभागगाव	े) भा चित्र
		गताविगासवात व्यात व्या	<b>1</b> 5]	

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स्थानिक चौरुझी समिती, शोरतवरी तटह लोन्सित व सिनेट गांग हात विरायी ठारुहून प्राप्त त्नारणादर क्लम ४३(६) व (७) यानुसार औत्म वे पनी-त्याचे आदेश शारनाक्टून निर्गीपत करण्याबाबत जोग्य ती जार्थवाही वेली पाईत -

. संबीधन महाविधात्यांना विषाझाखा हर करण्याची परवास्ती देवांना या महाविधातवांना विधापीठाने उसे नि:संवित्रधाने कटवावे ती, प्रवेश स्था पत्पुरत्यां स्वरणत देउन वर ४० विषाधीं प्रवेश घेतील तरच प्रत्यधात वर्ष दुल वरादे • नहाविधात्यात पुटे देण्यात येजारे स्तन्नीकरल ही छट पूर्ण वरण्याय स्वर्तहून राहील अन्यया महाविधातयांना स्वीधत विश्वाझाखां बंद करावी ताके स्वाम पर[६] व (७) अनुसार स्हर्ग्नीकरणाचा अतिम प्रस्ताव शासनावडे णाठीवताना ही घट पूर्ण ताही क्विंग नाही साबन्दक प्रस्तातामध्ये उल्लेख करावा अभी त्यांना 'वर्ग' स्वान्य येत आहे •

पंत्राची प्रत संबंधित त्यवस्थापनाक्ते पाठीवण्यात हेत आहे.

आपना दिश्वाम् दिःगाः [दः रा• मानी] सहारयक सचिव, महाराष्ट्र शालन

गत, १. शिक्षण तवालक (उच्च शिका), महाराष्ट्र राज्य, एणे. २. प्रशासनाधिकारी (उच्च शिका अनुदान), नाज्यूर विभाग, नाजपूर २. प्रायार्थ, कम्ला नेहरु महाविधालय, नाजपूर. ४. निच्चड नरती. 1