

**Sant Gadge Baba Amravati University,  
Amravati FACULTY:**

**Scheme of Teaching, Learning, Examination & Evaluation leading to Two Years PG Degree Master of Science (Electronics) following Three Years UG Programme w.e.f 2023-24  
(Two Years-Four Semesters Master's Degree Programme-NEPv23 with Exit and Entry Option**

**M.Sc. (Electronics) First Year Semester-I**

S. N.	Subject	Type of Course	Subject Code	Teaching & Learning Scheme						Duration Of Exam Hours	Examination & Evaluation Scheme									
				Teaching Period Per Week				Credits			Maximum Marks			Minimum Passing						
				L	T	P	Total	L/T	Practical		Total	Theory		Practical		Total Marks	Marks Internal	Marks External	Grade	
												Theory Internal	Theory +MCQ External	Internal	External					
0	*Pre-Requisite Course(s) if applicable/MOOC/Internship/Field Work cumulatively If students wish to opt Minor Course of UG as Major for PG, <b>balance 12 Credits</b> Course will have to be completed <b>(As and when applicable)</b>	Th-Prq		0	0	0	0	Additional Credit to be earned = (1) minus (2)(1). Credits from Major DSC Courses in UG (minus) (2). The Credits already earned from the Course as Minor at UG, now to be opted as Major at PG		2	15	35			50	06	14	P		
1	Research Methodology and IPR	Th-Major	1 ELE 1	4			4	4		4	3	30	70			100	12	28	P	
2	DSC-I.1 (Fundamentals of Semiconductor Devices)	Th-Major	1 ELE 2	4			4	4		4	3	30	70			100	12	28	P	
3	DSC-II.1 (Instrumentation and Measurement Techniques)	Th-Major	1 ELE 3	4			4	4		4	3	30	70			100	12	28	P	
4	DSC-III.1 (Optical Electronics Devices and Applications)	Th-Major	1 ELE 4	3			3	3		3	3	30	70			100	12	28	P	
5	DSE-I/MOOC (Biomedical Instrumentation or Mechatronics or Computer Hardware maintenance)	Th-Major Elective	1 ELE 5B 1 ELE 5M 1 ELE 5C	3			3	3		3	3	30	70			100	12	28	P	
																			Minimum Passing Marks	Grade
6	DSC-I.1 Lab	Pr-Major	1 ELE 6			2	2		1	1	3				25	25	50	25	P	
7	DSC-II.1 Lab	Pr-Major	1 ELE 7			2	2		1	1	3				25	25	50	25	P	
8	DSC-II.1 Lab	Pr-Major	1 ELE 8			2	2		1	1	3				25	25	50	25	P	
9	DSE-II Laboratory/MOOC Lab	Pr-Major Elective	1 ELE 9			2	2		1	1	3				25	25	50	25	P	
10	# On Job Training, Internship/Apprenticeship; Field projects Related to Major @ during vacations cumulatively	Related to DSC		120 Hours cumulatively during vacations of Semester I and Semester II							4*									P*
11	Co-curricular Courses: Health and Wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III and IV	Generic Optional		90 Hours Cumulatively From Sem I to Sem IV																
	TOTAL									22						600+50*				

Note: Exit options after M.Sc. I (1<sup>st</sup> Year PG) : 1 – To students who opt for DSE Biomedical Electronics will be awarded PG Diploma in Biomedical Instrumentation on Exit.

2 - To students who opt for DSE Mechatronics will be awarded PG Diploma in Mechatronics on Exit.

3- To students who opt for DSE Computer Hardware Maintenance will be awarded PG Diploma in Computer Hardware Maintenance on Exit.

**L:Lecture,T:Tutorial,P:Practical/Practicum**

Pre-requisite Course mandatory if applicable: **Prq**, Theory: **Th**, Practical/Practicum: **Pr**, Faculty Specific Core: **FSC**, Discipline Specific Core: **DSC**, Discipline Specific Elective: **DSE**, Laboratory: **Lab**, **OJT**: On Job Training: Internship/Apprenticeship; Field projects: **FP**; **RM**: Research

Methodology; Research Project: **RP**, **Co-curricular Courses: CC**

**Note :#** On Job Training, Internship/ Apprenticeship; Field projects **Related to Major (During vacations of Semester I and Semester II) for duration of 120 hours mandatory to all the students, to be completed during vacations of Semester I and/or II. This will carry 4 Credits for learning of 120 hours. Its credits and grades will be reflected in Semester II credit grade report.**

Note: **Co-curricular Courses:** In addition to the above, CC also include but not limited to Academic activities like paper presentations in conferences, Aavishkar, start-ups, Hackathon, Quiz competitions, Article published,

Participation in Summerschool/Winter School/Short term course, Scientific Surveys, Societal Surveys, Field Visits, Study tours, Industrial Visits, online/offline Courses on Yoga (Yoga for IQ development, Yoga for Ego development, Yoga for Anger Management, Yoga for Eyesight Improvement, Yoga for Physical Stamina, Yoga for Stress Management, etc.). These can be completed cumulatively during **Semester I, II, III and IV. Its credits and grades will be reflected in semester IV credit grade report.**



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**(Two Years-Four Semesters Master's Degree Programme-NEPv23 with Exit and Entry Option**  
**M.Sc. (Electronics) First Year Semester-II [Level 6.0]**

S. N.	Subject	Type of Course	Subject Code	Teaching & Learning Scheme							Duration Of Exam Hours	Examination & Evaluation Scheme								
				Teaching Period Per Week				Credits				Maximum Marks				Minimum Passing				
				L	T	P	Total	L/T	Practical	Total		Theory		Practical		Total Marks	Marks Internal	Marks External	Grade	
												Theory Internal	Theory +MCQ External	Internal	External					
1	DSC-I.2 Analog Circuit and Analysis	Th-Major	2 ELE 1	4			4	4		4	3	30	70			100	12	28	P	
2	DSC-II.2 Microprocessor and Microcontroller	Th-Major	2 ELE 2	4			4	4		4	3	30	70			100	12	28	P	
3	DSC-III.2 Digital IC's and Design	Th-Major	2 ELE 3	3			3	3		3	3	30	70			100	12	28	P	
4	DSE-I/MOOC (Biomedical Instrumentation or Mechatronics or Computer Hardware maintenance)	Th-Major Elective	2 ELE 4B 2 ELE 4M 2 ELE 4C	3			3	3		3	3	30	70			100	12	28	P	
5	DSC-I.2 Lab	Pr-Major	2 ELE 5			2	2		1	1	3			25	25	50		25	P	
6	DSC-II.2 Lab	Pr-Major	2 ELE 6			2	2		1	1	3			25	25	50		25	P	
7	DSC-III.2 Lab	Pr-Major	2 ELE 7			2	2		1	1	3			25	25	50		25	P	
8	DSE-III Laboratory/MOOC Lab	Pr-Major Elective	2 ELE 8			2	2		1	1	3			25	25	50		25	P	
9	# On Job Training, Internship/Apprenticeship; Field projects Related to Major @ during vacations cumulatively	Related to Major		120 Hours cumulatively during vacation of Semester I and Semester II							4*									P*
8	Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III and IV	Generic Optional		90 Hours Cumulatively From Semester I to Semester IV																
				Exit Option with a PG Diploma with 4 Credits On-the-job training/internship in the respective Major subject <ul style="list-style-type: none"> <li>Students have to earn Total minimum 4 Credits cumulatively during Vacation of Semester I and Semester II from internship in order to exit after First Year with PG Diploma (42-44 Credits) after Three Year UG Degree</li> </ul>																
	<b>TOTAL</b>										18+4*						550			

**L: Lecture, T: Tutorial, P: Practical/Practicum**

Pre-requisite Course mandatory if applicable: **Prq**, Theory : **Th**, Practical/Practicum: **Pr**, Faculty Specific Core: **FSC**, Discipline Specific Core: **DSC**, Discipline Specific Elective: **DSE**, Laboratory: **Lab**, **OJT**: On Job Training: Internship/ Apprenticeship; Field projects: **FP**; **RM**: Research Methodology; Research Project: **RP**, **Co-curricular Courses**: **CC**

**Note:** #On Job Training, Internship/Apprenticeship; Field projects Related to Major (During vacation of Semester I and Semester II) for duration of 120 hours mandatory to all the students, to be completed during vacation of Semester I and/or II.

**This will carry 4 Credits for learning of 120 hours. Its credits and grades will be reflected in Semester II credit grade report.**

Note: **Co-curricular Courses:** In addition to the above, CC also include but not limited to Academic activities like paper presentations in conferences, Aavishkar, start-ups, Hackathon, Quiz competitions, Article published, Participation in Summerschool/Winter School/Short term course, Scientific Surveys, Societal Surveys, Field Visits, Study tours, Industrial Visits, online/offline Courses on Yoga (Yoga for IQ development, Yoga for Egodevelopment, Yoga for Anger Management, Yoga for Eyesight Improvement, Yoga for Physical Stamina, Yoga for Stress Management, etc.). These can be completed cumulatively during Semester I, II, III and IV. **Its credits and grades will be reflected in semester IV credit grade report.**



## Sant Gadge Baba Amravati University

## Amravati FACULTY:

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**M.---(----)Second Year Semester-III**

S. N.	Subject	Type of Course	Subject Code	Teaching & Learning Scheme							Duration Of Exam Hours	Examination & Evaluation Scheme							
				Teaching Period Per Week				Credits				Maximum Marks			Minimum Passing				
				L	T	P	Total	L/T	Practical	Total		Theory Internal	Theory+ MCQ External	Internal	External	Total Marks	Marks Internal	Marks External	Grade
1	Contemporary Applied Technological Advancements in Research relevant/supportive to Major DSC-I.3	Th-Major		4			4	4		4	3	30	70			100	12	28	P
2	DSC-II.3	Th-Major		4			4	4		4	3	30	70			100	12	28	P
2	DSC-III.3	Th-Major		3			3	3		3	3	30	70			100	12	28	P
3	DSE-III/MOOC	Th-Major Elective		3			3	3		3	3	30	70			100	12	28	P
																			Minimum Passing Marks
4	DSC-I.3 Lab/Pr	Pr-Major				2	2		1	1	3			25	25	50		25	P
5	DSC-II.3 Lab	Pr-Major				2	2		1	1	3			25	25	50		25	P
5	DSC-III.3 Lab	Pr-Major				2	2		1	1	3			25	25	50		25	P
6	DSE-III Lab/MOOC Lab	Pr-Major Elective				2	2		1	1	3			25	25	50		25	P
7	Research Project Phase-I	Major				2	4	6	2	2	4			50	--	50		25	P
8	Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III and IV	Generic Optional																	
	<b>TOTAL</b>										22					500			

**L: Lecture, T: Tutorial, P: Practical/Practicum**

Pre-requisite Course mandatory if applicable: **Prq**, Theory : **Th**, Practical/Practicum: **Pr**, Faculty Specific Core: **FSC**, Discipline Specific Core: **DSC**, Discipline Specific Elective: **DSE**, Laboratory: **Lab**, **OJT**: On Job Training: Internship/ Apprenticeship; Field projects: **FP**; **RM**: Research Methodology; Research Project: **RP**, **Co-curricular Courses: CC**

Note: **Co-curricular Courses:** In addition to the above, CC also include but not limited to Academic activities like paper presentations in conferences, Aavishkar, start-ups, Hackathon, Quiz competitions, Article published, Participation in Summerschool/Winter School/Short term course, Scientific Surveys, Societal Surveys, Field Visits, Study tours, Industrial Visits, online/offline Courses on Yoga (Yoga for IQ development, Yoga for Ego development, Yoga for Anger Management, Yoga for Eyesight Improvement, Yoga for Physical Stamina, Yoga for Stress Management, etc.). These can be completed cumulatively during **Semester I, II, III and IV. Its credits and grades will be reflected in semester IV credit grade report.**

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**M.---(-----) Second Year Semester-IV [Level 6.5]**

S. N.	Subject	Type of Course	Subject Code	Teaching & Learning Scheme							Duration Of Exam Hours	Examination & Evaluation Scheme								
				Teaching Period Per Week				Credits				Maximum Marks			Minimum Passing					
				L	T	P	Total	L/T	Practical	Total		Theory		Practical		Total Marks	Marks Internal	Marks External	Grade	
												Theory Internal	Theory+ MCQ External	Internal	External					
1	DSC-I.4	Th-Major		4			4	4		4	3	30	70			100	12	28	P	
2	DSC-II.4	Th-Major		4			4	4		4	3	30	70			100	12	28	P	
3	DSC-III.4	Th-Major		3			3	3		3	3	30	70			100	12	28	P	
4	DSE-IV/MOOC	Th-Major Elective		3			3	3		3	3	30	70			100	12	28	P	
5	DSC-I.4 Laboratory	Pr-Major				2	2			1	1	3			25	25	50	25	P	
6	DSC-II.4 Laboratory	Pr-Major				2	2			1	1	3			25	25	50	25	P	
7	DSC-III.4 Laboratory	Pr-Major				2	2			1	1	3			25	25	50	25	P	
8	DSE-IV Laboratory/MOOC Lab	Pr-Major Elective				2	2			1	1	3			25	25	50	25	P	
9	Research Project Phase-II	Major				2	8	10	2	4	6	3			75	75	150	75	P	
10	Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III and IV	Generic Optional		90 Hours Cumulatively From Sem I to Sem IV																
	<b>TOTAL</b>										24						600			

**L: Lecture, T: Tutorial, P: Practical/Practicum**

Pre-requisite Course mandatory if applicable: **Prq**, Theory : **Th**, Practical/Practicum: **Pr**, Faculty Specific Core: **FSC**, Discipline Specific Core: **DSC**, Discipline Specific Elective: **DSE**, Laboratory: **Lab**, **OJT**: On Job Training: Internship/ Apprenticeship; Field projects: **FP**; **RM**: Research Methodology; Research Project: **RP**, **Co-curricular Courses: CC**

Note: **Co-curricular Courses**: In addition to the above, CC also include but not limited to Academic activities like paper presentations in conferences, Aavishkar, start-ups, Hackathon, Quiz competitions, Article published, Participation in Summer school/Winter School/Short term course, Scientific Surveys, Societal Surveys, Field Visits, Study tours, Industrial Visits, online/offline Courses on Yoga (Yoga for IQ development, Yoga for Egodevelopment, Yoga for Anger Management, Yoga for Eyesight Improvement, Yoga for Physical Stamina, Yoga for Stress Management, etc.). These can be completed cumulatively during Semester I, II, III and IV. Its credits and grades will be reflected in semester IV credit grade report.

**Table: Comprehensive Credits distribution amongst the type of Courses over Two Years (Four Semesters) PG Programme and Minimum Credits to be earned for PG Degree [Master in Faculty-----Major ---]**

Sr. No.	Type of Course	Total Credits Offered	Minimum Credits Required
<b>1</b>	<b>MAJOR</b>		
	<b>i. DSC</b>	<b>56</b>	<b>56</b>
	<b>ii. DSE</b>	<b>16</b>	<b>16</b>
	<b>TOTAL</b>	<b>72</b>	<b>72</b>
<b>2</b>	<b>Research Methodology and IPR (FSC/DSC:Major)</b>	<b>04</b>	<b>04</b>
<b>2</b>	On Job Training, Internship/ Apprenticeship; Field projects Related to Major	<b>04</b>	<b>04 for 120 Hours OJT/FPcu m. (Minimum 60 Hours OJT/FP is mandatory)</b>
<b>3</b>	<b>Research Project</b>	<b>10</b>	<b>10</b>
	<b>OPTIONAL</b>		
<b>4</b>	<b>Co-Curricular Courses (offline and/or online as applicable):</b> Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts, CC also include but not limited to Academic activities like paper presentations in conferences, Aavishkar, start-ups, Hackathon, Quiz competitions, Article published, Participation in Summer School/Winter School/Short term course, Scientific Surveys, Societal Surveys, Field Visits, Study tours, Industrial Visits, online/offline Courses on Yoga (Yoga for IQ development, Yoga for Ego development, Yoga for Anger Management, Yoga for Eye sight Improvement, Yoga for Physical Stamina, Yoga for Stress Management, etc.).		<b>00</b>
	<b>TOTAL</b>		
	<b>TOTAL</b>	<b>93</b>	<b>88</b>



**Table A: Comprehensive Credit Distribution for CC**

S. N.	Activities(offline/onlineas applicable)	Creditsat Levels						Letter Grade
		College	University	State	Zone ifexist	National	International ifexist	
1	Healthandwellness, Yoga*Competitions *If a Course (online/offline)on Yoga is completed for 60 Hours, 2creditswillbeawarded tothestudent (1Credit=30Hours)	1	2	3	4	5	6	P(Pass)
2	UnnatBharatAbhiyan[UBA]	1	2	3	4	5	6	P(Pass)
3	Sportsandfitnessactivities(seeseparate <b>Table B</b> )	1	1 / 2	2 / 3	3 / 4	4 / 5	5 / 6	P(Pass)
4	Culturalactivities,Fine/Applied/Visual/PerformingArts	1	2	3	4	5	6	P(Pass)
5	N.S.S.activitiesCamps	1	2	3	4	5	6	P(Pass)
6	AcademicactivitieslikeResearchPaper/Article/Posterpresentations,Aa vishkar, start-up, Hackathon, Quiz competitions, other curricular,co-curricularactivities,studentsexchange programme etc.	1	2	3	4	5	6	P(Pass)
	ResearchPaper/Articlepublished	--	1	2	-	4	6	P(Pass)
7	ParticipationinSummerschool/WinterSchool/Shorttermcourse	2Credits						P
	(not less than 30 hours 1 or 2 weeks duration)(notlessthan60hours 2or3weeks duration)	4Credits						(Pass)P
	ScientificSurveys,SocietalSurveys	2Credits						(Pass)P
	FieldVisits,Studytours,IndustrialVisits,	1Credit						(Pass) P(Pass)
8	NCCAactivities	Asgiven in <b>TableC</b>						

**TableB:CreditDistributionforSportsandFitness**

Sr. No.	ParticularsofSportsStatus( Individual/Team)	Credits	Letter Grade
1	CollegeLevelParticipation	1	P(Pass)
2	UniversityLevelParticipation	1	P(Pass)
3	UniversityLevelRank1,2,3	2	P(Pass)
4	StateLevelParticipation	2	P(Pass)
5	StateLevelRank1,2,3	3	P(Pass)
6	ZonalLevelParticipation	3	P(Pass)
7	ZonalLevelRank1,2,3	4	P(Pass)
8	NationalLevelParticipation	4	P(Pass)
9	NationalLevelRank1,2,3	5	P(Pass)
10	InternationalLevelParticipation	5	P(Pass)
11	InternationalLevel1,2,3	6	P(Pass)

**TableC:CreditDistributionforNCCactivities**

Sr.No.	ParticularsofNCCActivities	Credits	Letter Grade
1	ParticipationinNCCactivities	1	P(Pass)
2	'B'Certificateobtained	2	P(Pass)
3	'C'Certificateobtained	3	P(Pass)
4	StateLevelParticipation	4	P(Pass)
5	NationallevelParticipation	5	P(Pass)
6	InternationalLevelParticipation	6	P(Pass)

## **Sant Gadge Baba Amravati University, Amravati**

Sant Gadge Baba Amravati University,  
Amravati Faculty of Science and  
Technology **Programme: NEPv23 M. Sc.**  
**Electronics Science**

### **Programme: NEPv23 M. Sc. Electronics Science**

#### **POs:**

At the end of the programme, students would be able to

PO1 (Deep subject Knowledge and intellectual breadth) Apply the subject knowledge to the solution of real- world problems.

PO2 (Professional Ethics) Apply ethical principles and commit to professional ethics and responsibilities and norms of the standard practices.

PO3 (Creative & Critical Thinking) Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO4 (Innovation, Research and Problem Solving) Identify, formulate, review research literature, and analyze complex problems reaching substantiated and innovative conclusions. Design solutions for complex problems with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. Use research-based knowledge and research methods to provide valid conclusions. Demonstrate the knowledge of, and need for sustainable development.

PO5 (Team work and Communication Skills) Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. Present/communicate research at national/international level, write effective articles, reports and design documentation, make effective presentations, and give and receive clear instructions. Communicate disciplinary knowledge to the community and broader public.

PO6 (Professionalism and Leadership) Readiness Demonstrate personal accountability and effective work habits, e.g., punctuality, working productively with others, and time as well as workload management. Demonstrate integrity and ethical behavior, act responsibly with the interests of the larger community in mind, and to learn from his/her mistakes. Use the strengths

of others to achieve common goals, and use interpersonal skills to coach and develop others. Assess and manage his/her emotions and those of others; use empathetic skills to guide and motivate; and organize, prioritize, and delegate work.

PO7 (Lifelong learning) Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PO8 (Competence for Digital World) Prepare well for living, learning and working in a Digital Society; Create, select, and apply appropriate techniques, resources, and modern ICT tools to complex activities with an understanding of the limitations. Use existing digital technologies ethically and efficiently to solve problems, complete tasks, and accomplish goals. Demonstrate effective adaptability to new and emerging technologies.

PO9 (Global Citizenship) Act with an informed awareness of global issues. Engage in initiatives that encourage equity and growth for all.

**PSOs:**

Upon successful completion of the Programme, students would be able to

1. Apply knowledge of electronics to solve problems of the society.
2. Design electronics circuits/systems and analyze them

**Employability potential in Electronics:**

Some of the job profiles that students can opt for are mentioned below:

- Y Engineering Manager.
- Y Project Manager.
- Y Service Maintenance Engineer.
- Y Research and development engineer
- Y Marketing manager
- Y Industrial Engineer
- Y X-Ray technician
- Y Medical technician
- Y Hardware engineer in banking sector
- Y Engineer in mobile and communication sector
- Y Teaching sector
- Y Research sector
- Y Software development
- Y Sound technician
- Y Technical support executive
- Y Electrical supervisor
- Y Software test engineer
- Y Automation engineer
- Y Field service engineer

Aspirants pursuing M. Sc. Electronics Science have a lot of scope in diverse industries. These graduates can work in both private and public organizations in the fields of design, manufacture, operation, and maintenance of electronics equipment and practices.

A few of those employment areas are listed below:

**Areas of employment include but not limited to**

- IT sector

- Hardware manufacturing industry
- Telecommunication industry
- Defense sector
- Banking sector
- Tourism industry
- Education sector
- Research sector
- Automobile sector

**Name of the Programme: M.Sc. (Sem.-I) Subject: Electronics Science**

<b>Course : Research Methodology and Intellectual Property Rights</b>		
Subject Code: <b>1 ELE 1</b>	No. of Credits : 4	No. of hours per week: 4
Exam duration : 3Hrs	Maximum Marks : 100 (External:70 Internal:30)	Total No. of contact hours: 60

Units	Syllabus Content	Hours
1	Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method - Understanding the language of Research - Concept, Construct, Definition, Variable. Research Process. Research Design: Concept and Importance in Research - Features of a good research design - Exploratory Research Design - concept, types and uses, Descriptive Research Designs - concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.	15
2	Data Analysis: Data Preparation - Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis- Cross tabulations and Chisquare test including testing hypothesis of association. Interpretation of Data and Paper Writing- Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish? Ethical issues related to publishing, Plagiarism and Self-Plagiarism. Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline. Use of tools I techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/ Mendeley, Software for paper formatting like LaTeX/ MS Office, Software for detection of Plagiarism	15
3	INTRODUCTION TO IPR: Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights. Introduction to TRIPS and WTO. Kinds of Intellectual property rights-Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge. PATENT RIGHTS AND COPY RIGHTS Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and license Restoration of lapsed Patents, Surrender	15

	and Revocation of Patents, Infringement, Remedies & Penalties. COPY RIGHT-Origin, Definition & Types of Copy Right, Registration procedure, Assignment & licence, Terms of Copy Right, Piracy, Infringement, Remedies, Copy rights with special reference to software.	
4	TRADE MARKS-Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing Off, Penalties. Domain Names on cyber space. E-Governance and legal provisions. Digital signature and Electronic Signature. Cybercrimes	15

Course (DSC I.1) : Fundamentals of Semiconductor Devices		
Subject Code: 1ELE2	No. of Credits: 4	No. of hours per week: 4
Exam duration: 3 Hrs	Maximum Marks: 100 (External-70, Internal-30)	Total No. of contact hours: 60

U n i t s	Syllabus Content	H o u r s
1	<b>Conduction in semiconductor:</b> Semiconductors, brief idea about band theory of semiconductor, conduction mechanism, carrier concentration and mobility, effect of temperature on electric conductivity, intrinsic semiconductors, carrier concentration in an intrinsic semiconductor, conduction and valance band, carrier concentration in terms of band gap, electrical conductivity, generation and recombination of charges, extrinsic semiconductor- P type and N type, Hall effect	15
2	<b>Junction, Interface and semiconductor devices:</b> p-n junction, linearly graded and abrupt junctions, diode equation, static I-V characteristics, break-down mechanisms in p-n junction, dynamic behaviour of p-n junction, effect of temperature on p-n junction diode, Gunn effect and diode, Zener effect and Zener diode, Tunnel diode, PIN diode, varactor diode Schottky diode.	15
3	<b>Bipolar and unipolar semiconductor devices:</b> Bipolar junction transistor (BJT), principle of operation, fabrication methods and doping profile, analysis of ideal and real transistor, static I-V characteristics in active region, charge control equation. Junction and metal semiconductor field effect transistors, principle of operation, I-V characteristics, MOSFET-basic structure and operating principle, I-V characteristics, charge coupled devices, MESFET's.	15
4	<b>Semiconductor Technology &amp; Measurements:</b> Semiconductor devices & integrated circuit technology, wafer preparation, doping, growth of dielectric layers, measuring and lithography, pattern definition, methods of isolation planar technology. Semiconductor measurements: conductivity, resistivity, Hall effect measurements, drift mobility, minority carrier life time, diffusion length.	15

<b>Course(DSC II.1): Instrumentation and Measurement Techniques</b>		
Subject Code: 1ELE3	No. of Credits: 4	No. of hours per week: 4
Exam duration: 3 Hrs	Maximum Marks: 100 (External-70,Internal-30)	Total No. of contact hours: 60

<b>U n i t s</b>	<b>Syllabus Content</b>	<b>Ho u r s</b>
1	Display Devices and Digital Instruments: Digital display system and indicators, classification of displays, display devices, LED, LCD, touch screen displays. Digital multimeters, Digital frequency meter, Digital Tachometer, Digital pH meter, Automation in Digital Instruments, Digital phase meter, Digital capacitance meter, Microprocessor based Instrumentation.	15
2	General Electronic Test Equipment Cathode-Ray oscilloscope, Digital voltmeter & multimeter, electronic counters, AC millivoltmeter, wave analyzers and spectrum analyzer, signal generators, lock-in amplifiers, Frequency response analyzer.	15
3	Transducers and Signal conditioning Electrical transducers, Resistive transducers, Strain Gauges, Thermistor, LVDT, Piezo electric transducer, Temperature transducers, Mechanical transducers. Introduction of signal conditioning, block diagram of signal conditioning, Types of filters.	15
4	Measurement set-up Measurement of microwave frequencies, Resonant coaxial lines, cavity wave meters, RF/UHF field strength meter, measurement of sensitivity, intermodulation method, measuring frequency response in Audio amplifiers, measuring amplitude modulation using CRO.	15



<b>Course (DSC III.1): Optical Electronics Devices and Applications</b>		
Subject Code: 1ELE4	No. of Credits: 3	No. of hours per week: 3
Exam duration: 3 Hrs	Maximum Marks: 100 ( External:7,Internal-30)	Total No. of contact hours: 45

<b>Units</b>	<b>Syllabus Content</b>	<b>Hours</b>
1	Classification of optical fiber, Principal of light transmission through fiber, Fabrication of optical fibers, Material consideration, Loss and band width limiting mechanism, Mechanical and thermal characteristics, Light sources for fiber optics, Photo detectors, Source coupling, Splices and connectors. Fundamental of Optics Polarization, diffraction, interference, dispersion holograms.	15
2	Optical Sources and Optical detectors: Light Emitting Diodes (LEDs): Structure, Materials, Characteristics, Efficiency. Liquid Crystal Display (LCD), Thermal detectors, Photo detectors, Vacuum photo diode, Photo multiplier tube, Photoconductive detector, LDR, PIN diode.	15
3	Optical Instruments Optical pyrometer, Infrared thermometer, Polarimeter, Light intensity meter, Spectrophotometer, Spectrum analyzer, X-ray fluoroscopic instruments, Periscope, Optical filters, Beam splitters. Different types of lasers: Gas laser, Liquid lasers, Semiconductor lasers.	15

<b>Course (DSE I): Biomedical Instrumentation</b>		
Subject Code: 1ELE5B	No. of Credits: 3	No. of hours per week: 3
Exam duration: 3 Hrs	Maximum Marks: 100 (External-70, Internal-30)	Total No. of contact hours: 45

<b>Units</b>	<b>Syllabus Content</b>	<b>Hours</b>
1	Fundamentals of Biomedical Instrumentation: Basics of medical instrumentation system, Performance requirements of Medical Instrumentation System, Intelligent Medical Instrumentation System, biometrics. Bioelectric Signals: Origin of Bioelectric signals.	15
2	Electrodes: Recording Electrodes, Silver Chloride Electrodes, Electrodes for ECG, EEG and EMG. Biomedical Recorders: Electrocardiograph (ECG), vectorcardiograph (VCG), Electroencephalograph (EEG), Electromyograph (EMG), cardiac pacemakers.	15
3	Magnetic Resonance Imaging System: Principles of NMR Imaging System, Image Reconstruction Techniques, Basic NMR Components, Biological Effect of NMR Imaging, Advantages of NMR, Imaging System, principle of MRI. Radio-therapy Equipment: Use of high voltage X-ray Machines, Cobalt-60 Machine.	15

<b>Course (DSE I) : Mechatronics</b>		
Subject Code:1ELE5M	No. of Credits: 3	No. of hours per week: 3
Exam duration: 3 Hrs	Maximum Marks: 100 (External-70,Internal-30)	Total No. of contact hours: 45

<b>Units</b>	<b>Syllabus Content</b>	<b>Hours</b>
1	Mechatronics: What is mechatronics, design process, systems, measurement systems, control systems, Programmable logic controller. Closed loop Controllers: continuous and discrete control processes, Terminology, two step mode, Proportional mode, Derivative control, Integral control, PID controller, Digital controllers, Controller tuning, velocity control, Adaptive control.	15
2	Programmable Logic Controller: Programmable logic controller, basic PLC structure, I/P-O/PP processing, Ladder programming, Instruction lists, latching and integral relays, sequencing, timers and counters, Shift registers, Master and jump controls, data handling.	15
3	Communication Systems: Digital communications, Centralized, Hierarchical and Distributed control, Networks, Protocols, open systems Interconnection communication model, Serial Communication interfaces, Parallel Communication Interfaces, Wireless protocols	15

<b>Course (DSE I): Computer Hardware and Maintenance</b>		
Subject Code:1ELE5C	No. of Credits: 3	No. of hours per week: 3
Exam duration: 3 Hrs	Maximum Marks: 100 (External-70, Internal-30)	Total No. of contact hours: 45

<b>Units</b>	<b>Syllabus Content</b>	<b>Hours</b>
1	Computer Basics: Simple model of Computers, Characteristics of Computer, Problem solving, flow chart, program generation of computer, classification of computer. Memory and I/O devices: Main memory, Cache memory, Virtual memory, semiconductor memory, Memory controllers, Magnetic memory, Optical memory, Input units, output units, other units.	15
2	Processor: Structure of Instruction, Description of processor, CPU organization, Intel series of Microprocessor. Computer Architecture, Units, Processor to memory communication, I/O communications, Interrupts, Multiprogramming processor features, RISC, CISC.	15
3	Computer Software: Introduction, System software, programming Languages, Translator, Application Software, 4GL, Firmware, Middle ware, Popular Software packages. Operating systems: Need of OS, Types of OS, Introduction to DOS, Internal and External commands of DOS, BIOS and DOS, Interrupts, Interrupt services, DOS interrupts and functional Calls.	15

**Sant Gadge Baba Amravati University, Amravati.**

**Name of the Programme : M.Sc. (Sem.-II)**

**Subject : Electronics Science**

<b>Course(DSC I.2): Analog Circuit Design and Analysis</b>		
Subject Code:2ELE1	No. of Credits: 4	No. of hours per week: 4
Exam duration: 3Hrs	Maximum Marks: 100 (External-70, Internal-30)	Total No. of contact hours: 60

<b>U n i t s</b>	<b>Syllabus Content</b>	<b>H o u r s</b>
1	Operational Amplifiers: Difference Amplifier, Op-amp- block diagram, schematic symbol, Characteristics of Op-amp, the ideal Op-amp, equivalent circuit, open-loop Op-amp configurations. Op-amp with Negative Feedback: Block diagram of feedback configurations, voltage-series feedback amplifier, voltage shunt feedback amplifier, Differential amplifiers, output resistance and bandwidth of differential amplifiers with feedback.	15
2	Frequency Response and Linear applications of Op-amp: Open loop voltage gain as a function of frequency, closed loop frequency response, circuit stability, slew rate, DC and AC amplifiers, Differential I/P and O/P amplifier, voltage to current convertor with floating load and grounded load, current to voltage convertor, the Integrator, Differentiator, Adder and Subtractor.	15
3	Active Filters, Comparators and convertors: Active filters, First and second order Low-pass and Highpass, Butterworth filter, Band-Pass filters, Basic comparator, zero crossing detector, Schmitt trigger, comparator characteristics, limitations of comparator, window detector, voltage to frequency and frequency to voltage convertor, Clippers & Clampers, A to D convertor and D to A convertor.	15
4	Specialized IC Applications: The 555 timer as Monostable, Astable & Bistable multivibrator	15

	.PLL:operatingprinciples,monolithicPLL,565PLLapplications.VoltageRegulators:fixedvoltage regulator,Switching regulators,Special regulators.	
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<b>Course (DSC II.2) :Microprocessor and Microcontroller</b>		
Subject Code:2ELE2	No. of Credits: 4	No. of hours per week: 4
Exam duration: 3Hrs	Maximum Marks: 100 (External-70, Internal-30)	Total No. of contact hours: 60

<b>U ni ts</b>	<b>Syllabus Content</b>	<b>H ou rs</b>
1	Introduction:Features,Architectureof8086,Pin Diagram of 8086, Minimum Mode: Pin definitions in minimum mode,Minimum Mode Configuration, Bus Timing for Minimum Mode, Maximum Mode: Pin Definitions in maximummode, Maximum mode Configuration, Bus Timing for Maximum mode. Input/output Interfacing: I/O mapped I/O,memorymappedI/O.	15
2	Addressing modes and Instruction set: Addressingmodes:RegisterandImmediateModes,addressingmodesforAccessingdatainMemory(MemoryModes),AddressingModesAccessingI/OPorts(I/OModes)Relative Addressing Mode,ImpliedAddressing Mode,InstructionSet and Programming.	15
3	8051 Microcontrollers: Microcontrollers and embedded processors, overview of the 8051 family, inside8051,8051 flagbitsandthePSWregister,8051registerbanksandstack,the program counterandROMspaceinthe8051,Pindescriptionofthe8051, Data typesandDirectives.	15
4	AddressingModes and Instruction Set:Addressingmodes:Immediate&register addressing mode, Accessing Memory using various addressing modes, Bit Addresses for I/O and RAM,Introduction to8051Assembly programming, Assemblingand running an8051 program.JUMP, LOOP,andCALLInstructions, Arithmeticinstructions,signednumberconceptsandarithmeticoperations, Logicand compareinstructions, Rotateinstruction.	15

<b>Course (DSC III.2) :Digital IC's and Design</b>		
Subject Code:2ELE3	No. of Credits: 3	No. of hours per week: 3
Exam duration: 3Hrs	Maximum Marks: 100 (External-70, Internal-30)	Total No. of contact hours: 45

<b>U ni ts</b>	<b>Syllabus Content</b>	<b>H ou rs</b>
1	Combinational Logic Design: Function of binary variables, Boolean Algebraic theorems, standard form of logical functions, K-map up to five variables, Quine McCluskey method, don't care conditions and its effects, Synthesis using AND - OR gates.	15
2	Combinational logic design using 74/54 series MSI chip series concerning to multiplexers, demultiplexers, decoders, encoders, comparators, code converters, priority encoders parity generator/checker & BCD-Seven segment decoder. PLA, PAL, preliminary design concepts using FPGA's N-bit binary adder using 7480, Look-ahead carry adder construction.	15
3	Design of counter and sequential networks: Analysis of clocked sequential networks, General models of sequential machines, Equivalence and minimization networks, Deviation of state graph and tables, reduction of state assignments, S.M. Chart.	15

<b>Course (DSE II):Biomedical Instrumentation</b>		
Subject Code:2ELE4B	No. of Credits: 3	No. of hours per week: 3
Exam duration: 3 Hrs	Maximum Marks: 100 (External-70, Internal-30)	Total No. of contact hours: 45

<b>Units</b>	<b>Syllabus Content</b>	<b>Hours</b>
1	8-BIT MICROPROCESSOR AND 80X86 PROCESSORS: 8085 Architecture and Memory interfacing, interfacing I/O devices, Instruction set, Addressing Modes, Assembly language programming, counters and time delays, interrupts, timing diagram, Microprocessor applications. 8086 Architecture, Pin Configuration, 8086 Minimum and Maximum mode configurations, Addressing modes, Basic Instructions, 8086 Interrupts, Assembly levels programming.	15
2	MICROPROCESSOR PERIPHERALS AND INTERFACING: Serial and parallel I/O (8251 and 8255), Programmable DMA Controller (8257), Programmable interrupt controller (8259), keyboard display controller (8279), ADC/DAC interfacing. Inter integrated circuits interfacing (I2 C standard). Interfacing to alpha numeric displays, interfacing to liquid crystal display (LCD 16 x 2 line), high power Devices and Optical motor shaft encoders, stepper motor interfacing.	15
3	CONCEPTS OF MEASUREMENT: Measurements, instrumentation, errors in measurements, calibration and standard. TRANSDUCERS: Classification and characteristics of transducers, transducers for measurement of pressure, flow and temperature, optical sensors, acoustic sensors, DC and AC bridges.	15



<b>Course (DSEII) :Mechatronics</b>		
Subject Code: 2ELE4M	No. of Credits: 3	No. of hours per week: 3
Exam duration: 3 Hrs	Maximum Marks: 100	Total No. of contact hours: 45

<b>Units</b>	<b>Syllabus Content</b>	<b>Hours</b>
1	BASICS OF EMBEDDED SYSTEMS AND HARDWARE REQUIREMENTS: Introduction - Examples of embedded systems: Telegraph - Cordless bar - Code scanner - Laser printer -Underground tank monitoring - Nuclear Reactor monitor. Advanced hardware: Programmable array logic; Application Specific Integrated circuits (ASIC) and Field Programmable Gate arrays (FPGA) - Watch dog timers- Built - Ins on the microprocessor - Interrupt.	15
2	EMBEDDED SOFTWARE ARCHITECTURE: Round robin - round robin with interrupts - Function Queue scheduling Architecture - Real time operating systems Architecture - Selecting architecture REAL TIME OPERATING SYSTEM: Tasks and Task states - Tasks and Data - Semaphore and shared data - Timer functions - Events - Memory management - Interrupt routines in an RTOS Environment. Design of an embedded system	15
3	INTRODUCTION: Real Time System - Embedded Systems - Pervasive Computing - Information Access Devices - Smart Cards - Embedded Controllers - Hardware Fundamentals. Memory Management - Processes, Threads, Interrupts, Events - User Interface	15

<b>Course(DSE II) :Computer Hardware and Maintenance</b>		
Subject Code:2ELE4C	No. of Credits: 3	No. of hours per week: 3
Exam duration: 3 Hrs	Maximum Marks: 100 (External-70, Internal-30)	Total No. of contact hours: 45

<b>Units</b>	<b>Syllabus Content</b>	<b>Hours</b>
1	Microcomputer System &Peripherals: Computer Organization, Character & numbers, Codes, Memory, ALU. CU, IF, Interrupts, I/O, Device controllers, Error detection, MP, PC, K/B, CRT, Printer, Magnetic storage. Devices (FD, HD, MTD, OD), Special peripheral.	15
2	IBM PC H/W overview: Introduction (BIOX, DOS), PC family & H/W, System's box, M/B, I/O & Interrupts, DMA, Peripherals interface & Controller, K/B interface, Parallel & Serial interface, CRT controller, FDC, HDC, Memory Refresh, POST.	15
3	Motherboard: Dump & Smart chips, Role of 8284, 8288, 8259, & 8253, PPI 8255, Function of 8237, Functional units of M/B &its inter communication, Working of FDC, HDC, Display & K/ B controller.	15