ACADEMIC REGULATIONS
COURSE STRUCTURE AND
DETAILED SYLLABUS

DEPARTMENT OF PHYSICS

For

M.Sc. Physics (Fiber Optics & Communication)

(Two Year **Full Time** Program)

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(Autonomous)
Kukatpally, Hyderabad – 500 085, Telangana, India.

2015

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)
Kukatpally, Hyderabad – 500 085

ACADEMIC REGULATIONS 2015
For CBCS Based M.Sc (Regular/Full Time) Program
(Effective for the students admitted into I year from the
Academic Year 2015-**16** and onwards)

1.0 Post-Graduate Degree Program in M.Sc (PGP in M.Sc):
JNTUH offers 2 Year (4 Semesters) full-time **Master of Science** (M.Sc) Degree Programs, under Choice Based Credit System (CBCS) at its Constituent Autonomous College - JNTUH College of Engineering Hyderabad with effect from the Academic Year 2015 - 16 onwards.

2.0 Eligibility for Admission:

2.1 Admissions to the PGPs shall be made subject to the eligibility, qualifications and specializations prescribed by JNTUH College of Engineering Hyderabad, JNT University Hyderabad, for each Specialization under each M.Sc. Program, from time to time.

2.2 Admission to the PGP shall be made either on the basis of an Entrance Test conducted by the Jawaharlal Nehru Technological University Hyderabad / on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government from time to time.

2.3 The medium of instructions for all PG Programmes will be ENGLISH only.

3.0 M.Sc Program Structure:

3.1 The M.Sc Program in Physics, Chemistry and Mathematics of JNTUH-CEH are of Semester Pattern, with 4 Semesters constituting 2 Academic Years, each Academic Year having TWO Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 22 Weeks duration (inclusive of Examinations), with a minimum of 90 Instructional Days per Semester.

3.2 UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these PGP - Academic Regulations.

3.2.1 **Semester Scheme:**
Each Semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted are taken as 'references' for the present set of Regulations. The terms 'SUBJECT' or 'COURSE' imply the same meaning here, and refer to 'Theory Subject', or 'Lab Course', or 'Design/ Drawing Subject', or 'Seminar', or 'Comprehensive Viva', or 'Project', as the case may be.

3.2.2 **Credit Courses:**
All Subjects (or Courses) are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Subject/ Course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practicals Periods : Credits) Structure, based on the following general pattern.

3.2.3 **Course Nomenclature:**
The curriculum nomenclature or Course structure grouping for M.Sc Degree Program is as listed below

Each subject is assigned certain number of credits as specified below.

Theory Subjects	4 Periods / Week	3 or 4 Credits
Practical subjects	6 Periods / Week	2 Credits
Practical subjects	8 Periods / Week	3 Credits
Seminar	2 Periods / Week	1 Credit
Project		3 or 4 Credits

(Each period will be of 50 minutes duration)

4.0 Course Work:

4.1 A Student, after securing admission, shall pursue and complete the M.Sc PGP in a minimum period of 2 Academic Years (4 Semesters), and within a maximum period of 4 Academic Years (starting from the Date of Commencement of I Year).

4.2 Each student shall Register for and Secure the specified number of Credits required for the completion of the PGP and Award of the M.Sc Degree in respective Branch with the chosen Specialization.

4.3 I Year is structured to provide typically 22 Credits (22 C) in each of the I , II and III Semesters, and IV Semester comprises of 24 Credits (24 C), totaling to 90 Credits (90 C) for the entire M.Sc Program.

5.0 Course Registration:

5.1 A 'Faculty Advisor' shall be assigned to each M.Sc Program with respective Specialization, who will advise the Students about the M.Sc Program Specialization, its Course Structure and Curriculum, Choice/ Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

6.0 Attendance Requirements:

6.1 A Student shall be eligible to appear for the End Semester Examination (SEE) of any Subject, if he acquires a minimum of 75% of attendance in that Subject for that Semester.

6.2 A Student's Seminar Report and Seminar Presentation shall be eligible for evaluation, only if he ensures a minimum of 75% of his attendance in Seminar Presentation Classes during that Semester.

6.3 Condoning of shortage of attendance up to 10% (65% and above, and below 75%) in each Subject or Seminar of a Semester may be granted by the College Academic Council on genuine and valid grounds, based on the Student's representation with supporting evidence.

6.4 A stipulated fee per Subject/Seminar shall be payable towards condoning of shortage of attendance.

6.5 Shortage of Attendance below 65% in any Subject/Seminar shall in NO case be condoned.

6.6 A Student, whose shortage of attendance is not condoned in any Subject(s) or Seminar in any Semester, is considered as 'Detained in that Subject(s)/ Seminar', and is not eligible to take End Examination(s) of such Subject(s) (and in case of Seminars, his Seminar Report or Presentation are not eligible for evaluation) in that Semester; and he has to seek Re-registration for those Subject(s)/Seminar in subsequent Semesters, and attend the same as and when offered.

7.0 Academic Requirements:

The following Academic Requirements have to be satisfied, in addition to the Attendance Requirements mentioned in Item No. 6**.**

7.1 A Student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if he secures not less than 40% Marks (28 out of 70 Marks) in the End Semester Examination, and a minimum of 50% of Marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing B Grade or above in that Subject.

7.2 A Student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to - Seminar, and Comprehensive Viva-voce, if he secures not less than 50% of the total Marks to be awarded for each. The Student would be treated as failed, if he - (i) does not attend the Comprehensive Viva-voce as per the schedule given, or (ii) does not present the Seminar as required, or (ii) secures less than 50% of Marks (< 50 Marks) in -Seminar/ Comprehensive Viva-voce evaluations.
She/ he may reappear for comprehensive viva where it is scheduled again; For seminar, he has to reappear in the next subsequent Semesters, as and when scheduled.

7.3 A Student shall - register for all Subjects covering 90 Credits as specified and listed in the Course Structure for the chosen PGP Specialization, put up all the Attendance and Academic requirements for securing 90 Credits obtaining a minimum of B Grade or above in each Subject, and 'earn all 90 Credits securing SGPA $\geq$ 5.0 (in each Semester) and final CGPA (ie., CGPA at the end of PGP) $\geq$ 5.0, to successfully complete the PGP.

7.4 Marks and Letter Grades obtained in all those Subjects covering the above specified 90 Credits alone shall be considered for the calculation of final CGPA, which shall be indicated in the Grade Card of II Year II Semester.

7.5 Students who fail to earn 90 Credits as per the specified Course Structure, and as indicated above, within 4 Academic Years from the Date of Commencement of their I Year, shall forfeit their seats in M.Sc Program and their admissions shall stand cancelled.

7.6 When a Student is detained due to shortage of attendance in any Subject(s)/Seminar in any Semester, no Grade Allotment will be done for such Subject(s)/Seminar, and SGPA/ CGPA calculations of that Semester will not include the performance evaluations of such Subject(s)/Seminar in which he got detained. However, he becomes eligible for re-registration of such Subject(s)/Seminar (in which he got detained) in the subsequent Semester(s), as and when next offered, with the Academic Regulations of the Batch into which he gets readmitted, by paying the stipulated fees per Subject. In all these re-registration cases, the Student shall have to secure a fresh set of Internal Marks (CIE) and End Semester Examination Marks (SEE) for performance evaluation in such Subject(s), and subsequent SGPA/ CGPA calculations.

7.7 A Student eligible to appear in the End Semester Examination in any Subject, but absent at it or failed (failing to secure B Grade or above), may reappear for that Subject at the supplementary examination as and when conducted. In such cases, his Internal Marks (CIE) assessed earlier for that Subject/ Course will be carried over, and added to the marks to be obtained in the supplementary examination, for evaluating his performance in that Subject.

8.0 Evaluation - Distribution and Weightage of Marks:

8.1 The performance of a Student in each Semester shall be evaluated Subject-wise (irrespective of Credits assigned) with a maximum of 100 Marks for Theory, Practicals and 50 marks for Seminar.

8.2 a) For Theory Subjects, CIE Marks shall comprise of - Mid-Term Examination Marks (for 25 Marks), and Assignment Marks (for 5 Marks) for total of 30 marks.
b) During the Semester, there shall be 2 Mid-Term examinations. Each Mid-Term examination shall be for 25 Marks (with 120 minutes duration). The better performance out of these two Mid-Term Examinations shall be considered for the award of 25 Marks.

8.3 For Practical Subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 Internal Marks, and 70 Marks are assigned for Lab./Practicals End Semester Examination (SEE). Out of the 30 Marks for Internals, day-to-day work assessment in the laboratory shall be evaluated for 20 Marks; and the performance in an internal Lab./Practical Test shall be evaluated for 10 marks. The SEE for Lab./ Practicals shall be conducted at the end of the Semester by the concerned Lab. Teacher and another faculty member of the same Department as assigned by the Head of the Department.

8.4 There shall be a Seminar Presentation in I Semester II Semester and III Semester. For the Seminar, the Student shall collect the information on a specialized topic, and submit to the Department which shall be evaluated by a Departmental committee consisting of the Head of the Department and two faculty members both appointed by HOD at the time of Seminar Presentation. The Seminar Presentation shall be evaluated for 50 Marks. There shall be no SEE or External Examination for Seminar.

8.5 a) Every PGP Student shall be required to execute his M.Sc Project, under the guidance of the Supervisor assigned to him by the Head of Department. The PGP Project shall start immediately after the completion of the II Year I Semester, and shall continue through II Year II Semester. The Student shall carry out the literature survey, select an appropriate topic and submit a Project Proposal within 2 weeks (immediately after his II Year I Semester End Examinations), for approval by the Project Review Committee (PRC). The PRC shall be constituted by the Head of Department, and shall consist of the Head of Department, Project Supervisor, and a Senior Faculty Member of the Department both appointed by HOD. The Student shall submit his/ her Project Work Proposal to the PRC, on whose approval he can 'REGISTER for the PG Project'. Every Student must compulsorily register for his M.Sc Project Work, within the 2 weeks of time-frame as specified above. After Registration, the Student shall carry out his work, and continually submit 'a fortnightly progress report' to his Supervisor throughout the Project period. The PRC will monitor the progress of the Project Work Presentation and submission of M.Sc Project Work Report/ Dissertation.

b) The PRC shall evaluate the entire performance of the Student and declare the Project Report as 'Satisfactory' or 'Unsatisfactory'.

8.6 a) In cases, where the Board declared the Project Work Performance as 'unsatisfactory', the Student is deemed to have failed in the Project Viva-voce Examination, and he has to reappear for the Viva-voce Examination as per the Board recommendations. If he fails in the second Viva-voce Examination also, he will not be considered eligible for the Award of the Degree, unless he is asked to revise and resubmit his Project Work by the Board within a specified time period.

9.0 Re-Admission / Re-Registration:

9.1 **Re-Admission for Discontinued Students:**
Students, who have discontinued the M.Sc Degree Program due to any reasons what so ever, may be considered for 'Readmission' into the same Degree Program (with same specialization) with the Academic Regulations of the Batch into which he gets readmitted, with prior permission from the concerned authorities, subject to Item 4.1.

9.2 Re-Registration for Detained Students:
When any Student is detained in a Subject (s)/ Seminar due to shortage of attendance in any Semester, he may be permitted to re-register for the same Subject in the 'same category' (Core or Elective Group) or equivalent Subject if the same Subject is not available, as suggested by the Board of Studies of that Department, as when offered in the sub-sequent Semester(s), with the Academic Regulations of the Batch into which he seeks re-registration , with prior permission from the concerned authorities, subject to Item 4.1.

10.0 Grading Procedure:

10.1 Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practicals, or Seminar, or Project, etc., based on the % marks

obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 6 above, and a corresponding Letter Grade shall be given.

10.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured (Class Intervals)	*Letter Grade (UGC Guidelines)*	*Grade Points*
80% and above (≥ 80% , ≤ 100%)	O (Outstanding)	10
Below 80% but not less than 70% (≥ 70% , < 80%)	A^+ (Excellent)	9
Below 70% but not less than 60% (≥ 60% , < 70%)	A (Very Good)	8
Below 60% but not less than 55% (≥ 55% , < 60%)	B^+ (Good)	7
Below 55% but not less than 50% (≥ 50% , < 55%)	B (above Average)	6
Below 50% (< 50%)	F (FAIL)	0
Absent	**Ab**	**0**

10.3 A student obtaining F Grade in any Subject shall be considered 'failed' and is be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subjects will remain the same as those he obtained earlier.

10.4 A Letter Grade does not imply any specific % of Marks.

10.5 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course (excluding Mandatory non-credit Courses). Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a Course

10.6 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

SGPA = { $\sum_{i=1}^{N} C_i G_i$ } / { $\sum_{i=1}^{N} C_i$ } …. For each Semester,

where 'i' is the Subject indicator index (takes into account all Subjects in a Semester), 'N' is the no. of Subjects 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to the i^{th} Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Subject.

10.7 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses

in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year first semester onwards, at the end of each Semester, as per the formula

CGPA = { $\sum_{j=1}^{M} C_j G_j$ } / { $\sum_{j=1}^{M} C_j$ } … for all S Semesters registered (ie., upto and inclusive of S Semesters, S ≥ 1),

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1st Semester onwards upto and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the j^{th} Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j^{th} Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

10.8 For Merit Ranking or Comparison Purposes or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs will be used.

10.9 For Calculations listed in Item 10.5 – 10.8, performance in failed Subjects/ Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/ Courses will also be included in the multiplications and summations. However, Mandatory Courses will not be taken into consideration.

10.10 **Passing Standards :**

10.10.1 A student shall be declared successful or 'passed' in a Semester, only when he gets a SGPA ≥ 5.00 (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire PGP, only when gets a CGPA ≥ 5.00; subject to the condition that he secures a GP ≥ 6 (B Grade or above) in every registered Subject/ Course in each Semester (during the entire PGP) for the Degree Award, as required.

10.10.2 After the completion of each Semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the Registered Students of that Semester, indicating the Letter Grades and Credits earned. It will show the details of the Courses Registered (Course Code, Title, No. of Credits, Grade Earned etc.), Credits earned, SGPA, and CGPA.

11.0 Declaration of Results:

11.1 Computation of SGPA and CGPA are done using the procedure listed in 10.5 – 10.8.

11.2 For Final % of Marks equivalent to the computed CGPA, the following formula may be used ..

% of Marks = (CGPA – 0.5) x 10

12.0 Award of Degree and Class:

12.1 A Student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secures the required number of **90** Credits (with GP ≥ 6.0), shall be declared to have

'QUALIFIED' for the award of the M.Sc Degree in the chosen specialization as he/ she admitted.

12.2 **Award of Class**

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree, he shall be placed in one of the following four classes based on the % CGPA:

Class Awarded	CGPA
First Class with Distinction	≥ 7.75
First Class	6.75 ≤ CGPA < 7.75
Second Class	5.75 ≤ CGPA < 6.75
Pass Class	5.0 ≤ CGPA < 5.75

12.3 A student with final CGPA (at the end of the PGP) < 5.00 will not be eligible for the Award of Degree.

13.0 Withholding of Results:

13.1 If a Student has not paid fees to University/ College at any stage, or has pending dues against his name due to any reason whatsoever, or if any case of indiscipline is pending against him, the result of the Student may be withheld, and he will not be allowed to go into the next higher Semester. The Award or issue of the Degree may also be withheld in such cases.

14.0 Transitory Regulations:

14.1 A Student - who has discontinued for any reason, or who has been detained for want of attendance as specified, or who has failed after having undergone PGP, may be considered eligible for readmission to the same PGP with same set of Subjects/ Courses (or equivalent Subjects/ Courses as the case may be), and same Professional Electives (or from same set/category of Electives or equivalents as suggested), as and when they are offered (within the time-frame of 4 years from the Date of Commencement of his I Year I Semester).

15.0 Student Transfers:

15.1 There shall be no Branch/ Specialization transfers after the completion of Admission Process.

15.2 There shall be no transfer among the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.

16. MALPRACTICES RULES:

	Nature of Malpractices	Punishment
	If the candidate:	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	Refuses to obey the orders of the Chief Superintendent / Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that

		semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a 8police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the College / University for further action to award suitable punishment.	

17. GENERAL:

- **Credit**: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.
- **Credit Point:** It is the product of grade point and number of credits for a course.
- The Academic Regulations should be read as a whole for the purpose of any interpretation.
- The University/College reserves the right of altering the Academic Regulations and/or Syllabus/Course Structure, as and when necessary. The modifications or amendments may be applicable to all the candidates on rolls, as specified by the University/College.
- Wherever the words 'he' or 'him' or 'his' occur in the above regulations, they will also include 'she' or 'her' or 'hers'.
- Wherever the word 'Subject' occurs in the above regulations, it implies the 'Theory Subject', 'Practical Subject' or 'Lab.' and 'Seminar'.
- In case of any ambiguity or doubt in the interpretations of the above regulations, the decision of the Vice-Chancellor will be final.

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JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Sc. (Fiber Optics & Communication) – Full Time w.e.f 2015-16

I YEAR **I - SEMESTER**

S.No.	Course	Course Title	L	T	P	Credits
1	PHYS05101	Mathematical Physics	4	0	0	4
2	PHYS05102	Classical Mechanics	4	0	0	4
3	PHYS05103	Electromagnetic Theory	4	0	0	4
4		**Departmental Elective**				
	PHYS05104E	Electronic devices	4	0	0	4
	PHYS05105E	Materials Science	4	0	0	4
	PHYS05106E	Physics of Amorphous, Dielectric and Ferroelectric materials	4	0	0	4
5	PHYS05111	General Physics Lab - 1	0	0	6	2
6	PHYS05112	Electronics Lab	0	0	8	3
7	PHYS05113	Seminar	0	0	2	1
		Total Credits				**22**

I YEAR **II – SEMESTER**

S.No.	Course	Course Title	L	T	P	Credits
1	PHYS05201	Thermo Dynamics & Statistical Mechanics	4	0	0	4
2	PHYS05202	Computational Methods & programming in C	4	0	0	4
3	PHYS05203	Quantum Mechanics	4	0	0	4
4		**Departmental Elective**				
	PHYS05204E	Communication Theory	4	0	0	4
	PHYS05205E	Analog Communications	4	0	0	4
	PHYS05206E	Digital Communications	4	0	0	4
5	PHYS05221	General Physics Lab – 2	0	0	6	2
6	PHYS05222	C-programming Lab	0	0	8	3
7	PHYS05223	Seminar	0	0	2	1
		Total Credits				**22**

JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Sc. (Fiber Optics & Communication) – Full Time w.e.f 2015-16

II YEAR **I – SEMESTER**

S.No.	Course	Course Title	L	T	P	Credits
1	PHYS05301	Microprocessors	4	0	0	4
2	PHYS05302	Laser Physics	4	0	0	4
3	PHYS05303	Fiber Optics	4	0	0	4
		Departmental Elective				
	PHYS05304E	Condensed Matter Physics	4	0	0	4
4	PHYS05305E	Modern Physics	4	0	0	4
	PHYS05306E	Physics of Polymers	4	0	0	4
5	PHYS05331	General Physics Lab – 3	0	0	6	2
6	PHYS05332	Microprocessors Lab	0	0	8	3
7	PHYSO5333	Seminar	0	0	2	1
		Total Credits				**22**

II YEAR **II-SEMISTER**

S.No.	Course	Course Title	L	T	P	Credits
1	PHYS05401	Nuclear and Particle Physics	4	0	0	4
2	PHYS05402	Fiber Optic Sensors	4	0	0	4
3	PHYS05403	Optical Communication	4	0	0	4
4		**Departmental Elective**				
	PHYS05404E	C++ and Data Structures	4	0	0	4
	PHYS05405E	Physics of Solids	4	0	0	4
	PHYS05406E	Instrumentation	4	0	0	4
5	PHYS05441	General Physics Lab – 4	0	0	6	2
6	PHYS05442	Fiber Optics Lab	0	0	6	2
7	PHYS05443	Project				4
		Total Credits				**24**

JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Sc. I Year I-Sem (Fibre Optics & Communication)

L	T	P	C
4	0	0	4

PHYS05101 MATHEMATICAL PHYSICS

Unit I: Elementary Complex Analysis
Complex numbers, variables and functions – singularity – Analytic function, Cauchy Riemann equation – Cauchy's Integral theorem – Cauchy's Residual theorem.

Unit II: Matrices
Matrix algebra – Transpose, Inverse, Adjoint, Unitary Matrices – Eigen values and Eigen vectors – Diagonalisation.

Unit III: Differential Equations
Second order linear Ordinary Differential Equation's with variable coefficients, Solution by series expansion.

Unit IV: Special Functions
Legendre, Bessel, Generating functions, recursion relations, Hermite and Lagurre equations, Generating functions, recursion relations.

Unit V: Fourier Series
Fourier sine and cosine series, Fourier integral and transforms, FT of delta function, Applications of Fourier Transforms**,** Integral transforms, Laplace transform, first and second shifting theorems, Inverse LT by partial fractions, LT of derivative and integral of a function.

Text Books:
1. Mathematical Physics by Rajput.
2. Complex analysis by Churchill.

Reference Books:
1. Mathematical Methods for Physics, by G.Arfken.
2. Mathematical Physics, A.K.Ghatak, I.C.Goyal and S.L.Chua - Macmillan India Ltd.

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PHYS05102 CLASSICAL MECHANICS

UNIT I: Newtonian Formalism
Newtonian Mechanics of one and many particle systems. Conservation laws, Work-Energy theorem. Open Systems with variable mass. D'Alembert's Principle, Generalized coordinates.

UNIT II: Lagrangian Formalism
Lagrange's equations, Gyroscopic forces, Dissipative systems, Gauge invariance, invariance under Galilean transformation. Rotating frames, terrestrial and astronomical applications of coriolis force.

UNIT III: Central Forces
Two-body problem, Closure and stability of circular orbits, General analysis of orbits, Kepler's laws and equations. Artificial satellites. Scattering in a central force field.

UNIT IV: Variation Principles
The calculation of variations and Euler Lagrange's equations. Deduction of Hamilton's principle from D'Alembert's principle. Modified Hamilton's principle, Δ - variation. Prinicple of least action. Hamilton-Jacobi equation.

UNIT V: Canonical Transformations
Legender transformations, Generating functions, Procedure and conditions for application of canonical transformations. Poisson's brackets, Lagrange brackets. Relation between Lagrange and Poisson brackets.

Text Books:
1. Classical Mechanics, by H Goldstein (Addison Wesley, 1980).
2. Classical Mechanics, by N C Rana and P S Joag (Tata Mc Graw-Hill. 1991).
3. Classical mechanics, by J C Upadhyaya (HP H).

Reference Books:
1. Classical Mechanics, by A Sommerfeld (Academic Press, 1952).
2. Introduction to classical Mechanics, by Takwale and Puranik (T M H).

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PHYS05103 ELECTROMAGNETIC THEORY

Unit I: Maxwell's Equations
The equation of continuity for Time-Varying Fields – Inconsistency of Ampere's Law – Maxwell's equations – Conditions at a Boundary surface.

Unit II: Electromagnetic Waves
Solution for free-space conditions – Uniform plane – Wave propagation – Uniform plane waves – The Wave Equation for a conducting medium – Sinusoidal Time Variations – Conductors and Dielectrics – Polarization – Directions cosines.

Unit III: Reflection by a Perfect Conductors and Poynting Vector
Reflection by a perfect conductors normal incidence – Reflection by a perfect conductor – Oblique Incidence – Reflection by a perfect Dielectric – Normal Incidence – Reflection by a perfect Insulator – Oblique Incidence – Reflection at the surface of a conductive medium – Surface impedance – The Transmission – line Analogy - Poynting Vector and the flow of power, Poynting's theorem

Unit IV: Guided Waves
Waves between parallel planes – Transverse Electric Waves – Transverse Magnetic Waves Characteristics of TE and TM Waves – Transverse Electromagnetic Waves – Velocities of propagation – Attenuation in parallel – plane Guides – Wave Impedances – Electric Field and current Flow within the conductors – Transmission lines - Circuit Representation of the parallel-plane transmission line, parallel – plane Transmission lines with loss – E and H about Long parallel cylindrical conductors of Arbitrary cross section.

Unit V: Wave Guides
Rectangular guides – Transverse Magnetic waves in Rectangular guides – Transverse electric waves in rectangular guides – Impossibility of TEM wave in wave guides – Bessel functions – Solution of the Field equation – Cylindrical co-ordinates – TM and TE waves in circular guides – wave impedances and characteristics impedance– Attenuation factor of wave guides.

Text Books:
1. Electromagnetic wave and Radiating Systems, 2nd Edition, Edward C. Jordan, Keith G. Balmain.
2. 2000 solved problems in Electromagnetics, Syed Nasar, Schaum Series.

Reference Books:
1. Introduction to Electrodynamics – D.J.Griffith –PHI (1998).

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PHYS05104E ELECTRONIC DEVICES

Unit I: Semiconductor Physics

Energy bands – carrier concentration in intrinsic semiconductors in thermal equilibrium – charge densities in extrinsic semiconductor, Fermi Dirac Distribution, carrier concentration and fermi levels in extrinsic semiconductors semiconductor -direct and indirect band gap materials.

Unit II: Semiconductor Devices

Basic Equation for semiconductor device operation (qualitative), p-n junction diode, structure – depletion region and capacitance - junction break down – Zener diode, BJT, JFET, UJT, and MOSFET, structure, working, I-V characteristics.

Unit III: Photonic Devices

Radiative and non - radiative transitions, LED - effect of surface and indirect recombination, operation of LED, Diode lasers - conditions for population inversion in active region, light confinement factor. Optical gain and threshold current for lasing, Optical Absorption, , diode photo detectors, p-i-n photo detectors, Avalanche photo detectors, Solar cell-open circuit voltage and short circuit current, fill factor.

Unit IV: Microwave Devices

Tunnel diode, transferred electron device (Gunn diode). Avalanche Transit time device (REED diode).

Unit V: Memory devices

Static and Dynamic random access memories SRAM and DRAM, CMOS and NMOS, non-volatile – NMOS.

Text Books:

1. Solid State Electronic Devices by Ben G. Streetman, Sanjay Benerjee.
2. Semiconductor Devices- Physics and Technology, by SM Sze Wiley (1985).

Reference Books:

3. Introduction to Semiconductor devices, M.S. Tyagi, John Wiley & Sons.
4. Optical electronics by Ajoy Ghatak and K. Thyagarajan, Cambridge Univ. Press.

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PHYS05105E MATERIALS SCIENCE

Unit I: Atomic Structure and interatomic Bonding

Introduction, Atomic Structure – Fundamental Concepts, Electrons in atoms, The Periodic Table, Atomic Bonding in Solids – Bonding Forces and Energies, Primary Interatomic Bonds, Secondary Bonding or van der Waals Bonding, Mixed Bonding, Molecules, Bonding Type – Material Classification

Unit II: Dielectrics and Ferroelectrics

Macroscopic description of the static dieletric constant, the electronic and ionic polorizabilities of molecules. Orientational Polarization, Measurement or dielectric constant of a solid, the internal field of Lorentz, Clausius-Mosotti relation, elementary ideas on dipole relaxation.Classification of ferroelectric crystals- Ba TiO_3 and KDP, Dielectric theory of ferro-electricity, spontaneous polarization and ferroelectric hysteresis.

Unit III: Magnetic properties

Quantum theory of diamagnetism, origin of permanent magnetic moment, Theories of paramagnetism, paramagnetic cooling, spontaneous magnetization, Weiss theory of spontaneous magnetization, Nature and origin of the Weiss molecular field, Heisenberg exchange interaction, Hysteresis. The Block wall, Neel's theory of Antiferromagnetism. Ferromagnetism, Ferrite's and their applications (basic concepts on**ly).**

Unit IV: Superconductivity

Occurrence of Superconductivity, Experimental observations, Persistent currents, Effect of magnetic fields, Meissner effect, Type I and Type II super conductors, Intermediate states, Entropy and heat capacity, energy gap, Isotope effect, Thermal conductivity. Theoretical explanations, London's equation, Penetration depth, Coherence length Cooper Pairs, Elements of BCS theory, Giaver tunneling Josophson effects (basic ideas)

Unit V: Fiber optics and Lasers

Introduction , ray theory Transmission, Types of fibers, Photo conductor, fiber optic sensors. Lasers basic concepts condition for lasing action, Ruby laser, Helium – Neon laser Semi – Conductor lasers applications.

Text Books:

1. Materials science & Engineering by W.D.Callister (Jr)
2. Materials science by M.Arumugam

Reference Books: 1. Introduction to Materials Science by Vijaykumar S. M.

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4	0	0	4

PHYS05106E PHYSICS OF AMORPHOUS, DIELECTRIC AND FERROELETRIC MATERIALS

Unit-I: IONICS AND SUPERIONICS:

Superionic solids, classification of superionic solids, materials and structures, structural characterization, thermodynamic properties, Ionic transport (microscopic nature), Ion dynamic, applications superionic solids with special reference to solid state batteries.

Unit-II: PHYSICS OF AMORPHOUS MATERIALS

Introduction and preparation techniques, Glasses and glass transition, Structure of glass, atomic ordering in amorphous materials, Optical properties amorphous materials**,** Applications of amorphous materials.

Unit-III: DIELECTRICS

Single relaxation times, Debye's equations and Cole-Cole plots, Distribution of relaxation times, Cole-Davidson plots, Random approximation, Variation of dielectric properties with frequency, temperature, pressure, and composition. (dielectric properties of mixtures), Dielectric properties of glasses and polymers.

Unit-IV: MEASUREMENT

Measurement of dielectric properties, Scherring bridges, Q-meters and LCR meters and impedance analysiers. Review of piezoelectric and piezoelectric materials, lead based piezoelectric and applications.

Unit-V: FERROELETRICS:

Review of types of ferroelectrics and their important features methods of preparation of bulk ceramic ferroelectrics. Characterization of ferroelectrics, small signal dielectric measurements, method of measuring spontaneous polarization, pyrolectricity, polarization reversal. Theories of ferrolectricity, Dipole theory, Devonshire thory and pseudospin theory. Application of ferroelectric materials, piezoelectric transducers, pyroelectric detectors, electro-optic application. Second harmonic generators, SAW devices and memory devices.

Text Books:

1. Materials science and engineering by V.Raghavan
2. Solid state physics by Kittel

Reference Books:

3. Materials science and Engineering by W.D.Cellister
4. Materials science and Engg by S.M.Srivasthava.

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0	0	6	2

PHYS05111 GENERAL PHYSICS LAB – 1

1. Rigidity Modulus of a spring
2. Young's Modulus of a spring
3. Cauchy's Constants for ordinary Prism using white light
4. Diffraction Grating Using Sodium light
5. Hall Effect
6. B-H Curve
7. e/m ratio using small bar magnet
8. Diffraction due to circular aperture
9. Two probe method
10. Zeeman effect

Note: Any 8 experiments are to be performed by each student

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L	T	P	C
0	0	6	2

PHYS05112 ELECTRONICS LAB

1. Characteristics of P-N junction diode
2. Characteristics of Zener diode
3. Common Base-Characteristics
4. Common emitter – characteristics
5. Common collector – characteristics
6. Zener diode applications as voltage regulator
7. RC phase shift oscillator.
8. characteristics of PIN diode
9. Characteristics of LED
10. Rectifiers and filters

Note: Any 8 experiments are to be performed by each student

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L	T	P	C
4	0	0	4

PHYS05201 THERMODYNAMICS & STATISTICAL MECHANICS

UNIT I: Basics of Statistical Mechanics
Objective of Statistical Mechanics, Macrostates, Microstates, Phase space, Concept of Ensembles, Ensemble average, Liouville theorem, Conservation of extension in phase, Equation of motion and Liouville theorem, Equal a prior probability, statistical equilibrium, Microcanonical ensemble, Ideal gas, Quantization of phase space,

Unit II: Thermodynamics
Entropy, Equilibrium conditions, Quasistatic processes, Entropy of an ideal Boltzmann gas using the micro canonical ensemble, Gibbs paradox, Sackur-Tetrode equation, Entropy and probability. canonical ensemble, Entropy of a system in contact with a heat reservoir, Ideal gas in canonical ensemble, Maxwell velocity distribution, Equipartition of energy.

UNIT III: Grand Canonical Ensemble
Ideal gas in grand canonical ensemble, comparison of micro canonical, canonical and grand canonical ensembles,Canonical partition function, Molecular partition functions, Translational partition function, Rotational partition function, Vibrational partition function.

UNIT IV:Ideal Bose-Einstein Gas
Bose-Einstein distribution, Bose-Einstein condensation, liquid helium, Two-fluid model of liquid helium II.

UNIT V: Ideal Fermi-Dirac Gas
Fermi-Dirac distribution, Degeneracy, electrons in metals, Thermionic emission, Magnetic susceptibility of free electrons.

Text Books:
1. Statistical Mechanics By B.K. Agarwal & Melvin Eisner.
2. Statistical Mechanics By E.S Raja Gopal.

Reference Books:

1. Statistical Mechanics by Battacharya.
2. Fundamentals of Statistical and Thermal Physics by Frederick Reif.

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4	0	0	4

PHYS05202 COMPUTATIONAL METHODS AND PROGRAMMING IN C

Computational Methods

UNIT I: Solutions of Equation

Methods for determination of zeroes of linear and non linear algebraic equations and transcendental equations, convergence of solutions. Solutions of simultaneous linear equations, Gaussian elimination, pivoting, iterative Method, matrix inversion. Eigenvalues and eigenvectors of matrices, Power and Jacobi Method.

UNIT II: Numerical Differentiation And Integration

Newton-Cotes formulae, error estimates, Gauss method. Random variation, Monte Carlo evaluation of Integrals, Methods of importance sampling, Random walk and Metropolis method.Numerical solution of ordinary differential equations, Euler and Runge Kutta methods, Predictor and corrector method. Elementory ideas of solutions of partial differential equations.

Programming in 'c'

UNIT III: Basics

Background , Sample program , Components of a C program , Data types ,Naming conventions for variables , Printing and initializing variables , Defining arrays, Functions and Invoking functions , Elementary operators , The conditional operator , Increment and decrement operators.

UNIT IV: Condition Constructs and Function

if statement , if else statement , while loop , for loop , do while loop , break and continue statements , switch statement , else if, General function declarations , Returning a value or not, Function prototypes, Arguments and parameters.

Unit –V: Pointers & Directions

Fundamental concepts , Pointer operators and operations , Changing an argument with a function call , Pointer arithmetic ,Traversing arrays with a pointer , Relationship between array and pointer

Text Books:

1. Rajaraman: Numerical Analysis.
2. C Programming using turbo C++, 2nd edition, Robart Lafore.
3. Let Us 'C' – Yashwanth Kanithkar.

Reference Books:

1. Sastry: Introductory Methods of Numerical Analysis
2. Numerical Recipes in 'C' 2nd edition, W.H.Press, S.A.Teukolsky,W.T.Wellering, B.P.Flannery.

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PHYS05203 QUANTUM MECHANICS

UNIT I: Fundamental Concepts
Inadequacy of classical mechanics, Schrodinger equation, continuity equation, Ehrenfest theorem, Admissible wave functions, Stationary states - One-dimensional problems, wells and barriers, Harmonic oscillator by Schrodinger equation and by operator method.

UNIT II: General Formalism
Uncertainty relation of x and p, states with minimum uncertainty product, General formalism of wave mechanics, Commutation relations, Representation of states and dynamical variables, Dirac delta function, bra and ket notation, Matrix representation of an operator.

UNIT III: Angular momentum Formalism
Angular momentum in QM, Central force problem: Solution of Schrodinger equation for spherically symmetric potentials, Hydrogen atom.

UNIT IV: Time dependent Perturbation
Time-independent perturbation theory, Non-degenerate and degenerate cases, Applications such as Stark effect - Variational method: WKB approximation and time dependent perturbation theory.

UNIT V: Relativistic Quantum Mechanics
Klein Gordon equation – plane wave solutions and equation of continuity – Dirac equation – probability density – Dirac matrices – Plane wave solutions – Significance of negative energy states – spin of the Dirac particle – Dirac particle in electromagnetic fields – Dirac equation in covariant form – Gamma matrices.

Text Books:

1. L I Schiff, Quantum Mechanics (McGraw-Hill).
2. Mathews and Venkateshan, Quantum Mechanics.

Reference Books:

1. Quantum mechanics by E.Merzbacher (Wiley 1970).
2. B Craseman and J D Powell, Quantum Mechanics (Addison Wesley).

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PHYS05204E COMMUNICATION THEORY

UNIT I: Introduction to Fourier Series
Signal analysis, The sampling function, Response of a linear system, normalized power, normalized power in Fourier Expansion. Fourier Transform, Fourier transforms of discrete functions.

UNIT II: Amplitude Modulation Systems
Frequency translation, A method of Frequency translation, recovery of baseband signal (Synchronous detection), Amplitude modulation- Envelope detection, spectrum of an amplitude modulated signal, modulators and balanced modulators-DSB, Single sideband, modulation (SSB). Vestigial Side band modulation (VSB), Multiplexing.

UNIT III: Frequency Modulation System
Angle modulation, Phase and frequency modulation, spectrum of an FM signal (Sinusoidal Signal). Some features of Bessel coefficients, Phasor diagram of FM Signal, Reactive Modulators,FM demodulators.

UNIT IV: Pulse Modulation Systems
Sampling theorem. Types of sampling. Principles of PAM, PWM methods. Pulse code modulation. Delta modulation.

UNIT V: Noise
Thermal noise, shot noise, noise power spectral density, Noise figure and noise temperature. Available gain. Noise figure of a single amplifier.

Text Books:

1. S.S. Haykins communication System, Wiley Ester.
2. Taub and Schilling – Principles of Communication – T.M.H.

Reference Books:

1. A.B. Carlson, Communication Systems (I S E).

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PHYS05205E ANALOG COMMUNICATION

UNIT I: AMPLITUDE MODULATION

Introduction to communication systems, Need for modulation, Frequency Division Multiplexing, Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law modulator, switching modulator, detection of AM waves, Square law detector, Envelop detector, Double sideband suppressed carrier modulators,

UNIT II: SSB MODULATION

Introduction to Hilbert transform, Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves, demodulation of SSB waves, vestigial sideband modulation, frequency description,

UNIT III: ANGLE MODULATION

Basic concepts, frequency modulation, single tone frequency modulation, spectrum analysis of sinusoidal FM wave, Narrow band FM, Wideband FM, Constant average power, transmission bandwidth of FM wave-generation of FM waves, direct FM, Detection of FM waves:

UNIT IV: NOISE

Resistive noise source(thermal), arbitrary noise sources, effective noise temperature, average noise figures, average noise figure of cascaded networks, narrow band noise, quadrature representation of narrowband noise and its properties, Noise in analog communication system, noise in DSB and SSB System, Noise in AM system,

UNIT V: RECEIVERS

Radio receiver-receiver types, tuned radio frequency receiver, super heterodyne receiver, RF Section and characteristics- frequency changing and tracking, intermediate frequency, AGC, FM receiver, comparison with AM receiver, amplitude limiting, Pulse modulation- types of pulse modulation,

Text Books:

1. Communication Systems by Simon Haykins, John wiley & Sons, IV Edition.
2. Electronic communications – Dennis Roddy & John Coolean, IV Edition, PEA, 2004
3. Communications Systems – B.P.Lathi, BS Publicaions, 2004

Reference Books:

1. Analog and Digital Communications-Simon Haykins, John Wiley, 2005.
2. Digital and Analog Communication Systems: Sam Shanmugam, John Wiley, 2005

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4	0	0	4

PHYS05206E DIGITAL COMMUNICATIONS

UNIT I: Elements of Digital Communication Systems
Modal of digital communication Systems, Digital Representation of Analog Signal, Certain Issues in Digital Transmission, Advantages of Digital Communication Systems, Sampling Theorem, Types of Sampling – Impulse Sampling, Natural Sampling, Flat –Top Sampling, Introduction to baseband Sampling, PCM Generation and Reconstruction, Quantization Noise, Non Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and DM Noise in PCM and DM.

UNIT II: Digital Modulation Techniques
Introduction, ASK, ASK Modulator, Coherent ASK Detector, Non-Coherent ASK Detector, FSK, Bandwidth and Frequency Spectrum of FSK, Non –Coherent FSK Detector, Coherent FSK Detector, FSK Detection using PLL, BPSK, Coherent PSK Detection, QPSK, Differential PSK,

UNIT III: Baseband transmission and optimal reception of Digital Signal
A Baseband signal receiver, Probability of error, Optimum receiver, Coherent reception, Signal space representation and probability of error, Eye diagrams, cross talk.

UNIT IV: Entropy information rate, Source Coding
Huffman coding, Shannon Fano coding, Mutual Information, Channel capacity of discrete channel, Shannon Hartley law, Trade of between bandwith and SNR

UNIT V: Error Control Codes
Linear block codes, Matrix description of linear block codes, Error detection and Error correction capabilities of linear block codes, Cyclic codes- Algebraic structure, Encoding, Syndrome calculation, Decoding. Convolution codes, encoding, decoding using state, tree and trellis diagrams, decoding using viterbi Algorithm, Comparison of error rates in coded and un-coded transmission.

Text Books:

1. Principles of Communication Systems: Herbert Taub, Donald L Schilling, Goutam Saha, III Edition, Mcgraw-Hill, 2008.
2. Digital and Analog Communication Systems: Sam Shanmugam, John Wiley, 2005.

Reference Books:

1. Digital Communications-John G, Proakis, Masoud Salehi, V Edition, Mcgraw-Hill, Digital Communications-Simon Haykins, John Wiley, 2005.
2. Digital Communications-Ian A. Glover, Peter M. Grant, II Edition, Pearson Edu.,
3. Communications Systems – B.P.Lathi, BS Publicaions, 2006.

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0	0	6	2

PHYS05221 GENERAL PHYSICS LAB - 2

1. Estimation of errors Gaussian distribution.
2. Diffraction by Single slit Sodium light
3. Diffraction by Double slit Sodium light
4. Viscosity of liquids using oscillating disc method
5. Photo cell- Planck's constant using filters
6. Solar cell characteristics
7. Thermistor characteristics
8. Stefan's constant
9. Polarimeter- Specific rotatory power of sugar solution
10. LASER Characteristics

Note: Any 8 experiments are to be performed by each student

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PHYS05222 C PROGRAMMING LAB

COMPUTATIONAL METHODS

1. Program for differentiation using Bisection method.
2. Program for Newton-Raphson method.
3. Program for simultaneous linear equation using Gaussian elimination method.
4. Program for simultaneous linear equation using Gauss-Seidel method.
5. Program for interpolation using Newton's divided difference method.
6. Program for interpolation using Lagrange method.
7. Numerical integration using Trapezoidal method.
8. Program for Numerical integration by using Simpsons 1/3 rule.
9. Program to solve ordinary differential equations using Euler's method.
10. Program to solve ordinary differential equations using Range-Kutta method.
11. Program to find the matrix inversion method.

Note: Any 8 experiments are to be performed by each student

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L	T	P	C
4	0	0	4

PHYS05301 MICROPROCESSORS

UNIT I: Introduction to Microporcessors
Introduction to Intel family 8 & 16 bit microprocessors features of 8085, Functional block diagram, registers, instructions and addressing modes. Simple programs using the instruction set of 8085.

UNIT II: Architecture of Microprocessor
Features of 16- bit microprocessors, Signal description and pin configuration of 8086 microprocessors, Internal architecture of 8086/8088, Difference between 8086 and 8088. Demultiplexed 8086.

UNIT III:Instruction Set 8086
Instruction set of 8086 microprocessor, Addressing modes, Interrupt structure of 8086, stack and subroutine concepts. Timing diagrams of a few simple instructions.

UNIT IV: Assembly Language Programming
Simple programs, programs using MASM611- assembler, implementation of features like IF-THEN-ELSE, WHILE-DO LOOP, REPEAT-UNTIL LOOP & FOR LOOP.

UNIT V: Interfacing
8086 system bus structure: memory and I/O interfacing with 8086, Interfacing 8086 with 8255, 8254, interfacing stepper motor.

Text Books:

1. D.V. Hall: Microprocessing & Interfacing Programming And Hardware-TMH-II Edition.
2. Barry. B. Brey: The Intel Microprocessors, (4th Edition), Prentice Hall Of India.
3. D.V.Hall: Microprocesors And Digital Systems, 2nd Edition (For 8085).

Reference Books:

1. Microprocessors and Microcontrollers by K.Raghunathan

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PHYS05302 LASER PHYSICS

UNIT I: The Einstein Coeffecients And Light Amplification

Introduction, The Einstein Coefficients, Quantum Theory for the evaluation of the Transition Rates and Einstein Coefficients, More Accurate delution for the Two-Level System, Line Broadening Mechanisms, Saturation behavior of Homogeneously and In homogeneously Broadened transitions.

UNIT II: Laser Rate Equation And Semiclassical Theory Of The Laser

The Tree-level system, Four-level System, variation of Laser Power around Threshold. Optimum output coupling, Laser spiking, cavity modes polarization of the cavity medium First- order Theory and Higher- order Theory.

UNIT III: Optical Resonators

Modes of rectangular cavity and the open planar resonator, Confocal Resonator, The Quality Factor, Ultimate line width of the Laser, Transverse and Longitudinal mode selection , Q-switching, mode locking in lasers, , Geometrical Optic Analysis of Optical Resonators.

UNIT IV: Interaction Of Radiation Field With Matter

Quantization of the electromagnetic field, Eigenkets of the Hamiltonian, The coherent states, Transition Rates, the Phase-Operator, Coherence properties of Laser Light, The Ruby, Helium Neon Laser, solid state Laser, Carbon Dioxide Laser, Dye Lasers, Semiconductor Lasers.

UNIT V: Applications

Spatial Frequency Filtering, Holography, Laser Energy Requirements. Laser- Induced Fusion Reaction. Large information – carrying capacity of light waves, Light wave Communication System (optical Fiber, Modulators and Detectors). Harmonic Generation, Stimulated Raman Emission.

Text Books:

1. Lasers by K. Thygarajan and A.K.Ghatak.
2. Optical Electronics by Thygarajan and A.K. Ghatak.
3. Lasers : Siegman.

Reference Books:

1 Optical Electronics by Yariv.
2. Opto Electronics by Milson.

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PHYS05303 FIBER OPTICS

UNIT I: Propagation in Fiber
Introduction to Fiber propagation using a Ray Model, Material Dispersion. Refractive index theory of a bulk media, Experimental values, Time dispersion in bulk media, The combined effect of Material & Multipath Dispersion, RMS pulse widths and frequency Response.

UNIT II: Fabrication & Assessment of Fibers
Fiber production Methods- Double crucible method, Vapor axial deposition (VAD) method, MCVD method, Cables, Splices & connectors, Attenuation Mechanisms in optical fibers.

UNIT III: Wave Propagation in Step Index Fibers
Modes and Rays, Wave Propagation modes in an ideal step-index Filter, solution of wave equation, solution for propagation constant, variation of propagation constants with frequency, Weakly guiding solutions, Types of single mode fibers.

UNIT IV: Wave Propagation in Graded Index Fibers
Modes in graded- Index Fibers, The equivalence of the WKB Approximation & Ray Modal. Intermode Dispersion in graded-Index Fibers, Intramode Dispersion in graded-Index Fibers. Total Dispersion in Graded Index Fibers.

UNIT V: Optical Amplifiers
Basic applications and types of optical amplifiers, semiconductor optical amplifiers, raman amplifiers, Erbium doped fiber amplifiers, amplifier noise, system application.

Text Books:

1. OPTICAL COMMUNICATION SYSTEM – JOHN GOWAR.
2. OPTICAL FIBER COMMUNICATIONS – JOHN M SENIOR.

Reference Books:

1. OPTICAL FIBER COMMUNICATIONS BY D J KEISER .

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PHYS05304E CONDENSED MATTER PHYSICS

UNIT I: Crystal Physics
Crystalline solids, unit cells and direct lattice, two and three dimensional Bravais lattices, closed packed structures. Interaction of X-rays with matter, absorption of X-rays. Elastic scattering from a perfect lattice. The reciprocal lattice and its applications to diffraction techniques. The Laue, powder diffraction methods, crystal structure factor.

UNIT II: Defects in Crystals
Point defects, ,line defects and planar (stacking) faults, estimation of Schottky and Frenkel defects, edge and screw dislocations-Burger vectors. The role of dislocations in plastic deformation and crystal growth- The observation of imperfections in crystals, X-ray and electron microscopic techniques.

UNIT III: Electronic Properties of Solids
Electrons in a periodic lattice, Bloch theorem, band theory(Kronig –Penny model), Brillouin Zones, classification of solids, effective mass of electron, Tight-bonding, cellular and pseudo potential methods.

UNIT IV: Superconductivity
Fermi surface, de Hass von Alfen effect, cyclotron resonance, magneto- resistance, quantum Hall effect. Superconductivity: critical temperature, persistent current, Meissner effect.BCS theory, Applications of superconductors.

UNIT V: Magnetic Properties
Weiss theory of ferromagnetism. Heisenberg model and molecular field theory. Spin waves a magnons and spintronics, Curie-Weiss law for susceptibility, Ferri- and anti ferromagnetic order. Domains and Bloch-wall energy.

Text Books:
1. Verma and Srivastava: crystallography for Solid State Physics.
2. Solid State Physics by A.J. Dekker.
3. Omar: Elementary Solid State Physics.

Reference Books:
1. Introduction to Solids: Leonid V.Azaroff.
2. Introduction to Solid State Physics by Charles Kittel.

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PHYS05305E MODERN PHYSICS

Unit – I: Origins of Quantum Physics

Blackbody Radiation and h, Photoelectric effect, X Rays, Compton scattering, atomic spectra Bohr atom - quantization of energy, Electron waves, travelling wave propagation, medium and EM fields, Standing waves in the Bohr atom, Electron wave packets, Heisenberg uncertainty

Unit – II: Electromagnetic Waves

Equation of continuity, Maxwell's equations, Maxwell's equations in integral and differential forms, Physical Significance, Pointing theorem, Poynting vector, The wave equation, plane Electro magnetic wave in free space, plane Electro magnetic wave in anisotropic non conducting medium, plane Electro magnetic wave in isotropic non conducting medium, plane Electro magnetic wave in conducting medium.

Unit – III: Diffects in Solids

Introduction, classification of imperfections, point defects; vacancies, impurities, interstitials, color centues, Schottkey defects, Frenkel defects. Estimation of concentration of Schottkey defects and Frenkel defects at a given temperature. Line Defects: Edge dislocation, Screw dislocation, Burger's circuit and Burger's vector.

Unit – IV: Super conductors

Super conducting phenomenon, Zero electrical resistance, Meissner's effects, magnetic phase diagram, energy gap, isotope effect, flux quantization, Josephson effect and tunneling, SOULD, London equations, BCS theory, application of superconductors.

Unit – V: Photonic devices

Light emitting diodes, photo diode, solar sells, photo transistor.

Text Books:

1. EM Waves and Radiating Systems by Edward C.Jordon Keith G. Balmain
2. Electro magnetic theory and Electrodynamics by Satya Prasad

Reference Books:

3. Introduction to solid state physics by C.Kittel
4. Physics of Semiconductor Devices by S.M.Sze.

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PHYS05306E PHYSICS OF POLYMERS

UNIT I: Introduction to Polymers

Introduction to polymers, classification of polymers thermoplastics and Thermosets, glass transition temperature (Tg) melting temperature (Tm), control of Tm and Tg and relation between them, Dependence of Tm and Tg on copolymer composition.

UNIT II: Polymer Structures

Introduction, Hydrocorban Molecules, Polymer Molecules, The chemistry of Polymer Molecules, Molecular Weight, Molecular Shape, Molecular Structure, Molecular Configurations, Thermoplastic and Thermosetting Plymers, Copolymers, Polymer Crystellinity, Polymer Crystals

UNIT II: Classification of Polymers

Polymer additices: Plastioizers, and reinforce other important additives: Stabilizers, flame retardants, Biocious colorants, Polymer blends, polymer composites, properties, toughened plastics and phase separated blends.

UNIT III: Analysis of Polymers

Analysis and testing of polymer by spectroscopic memory Infrared spectroscopy, nuclear magnetic resonance, X-ray diffrention Thermal analysis of polymer: Differential scanning calorimetry, Differential Thermal Analysis and Thermo gravimetric method.

UNIT IV: Super Ionic Solids

Super Ionic solids, classification, Ionic Transport, Ion Dynamics, Polymer electrolytes and their advantages, Applications with special reference to batteries.

Text Books:

1 An Introduction to polymer physics-I by Perepechko
2 Polymer science and technology-by Joel.R.Fried

Reference Books:

3 Text Book of polymer Science by Fred W Billmeyer,
4 Super ionic solids by S. Chandra

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PHYS05331 GENERAL PHYSICS LAB - 3

1. Magnetic Susceptibility of solid
2. Dielectric Constant of given material
3. Abbe's Refractometer using different liquids and different concentrations
4. Specific Heat of Solids
5. Refractive Index of Ordinary and Extra-Ordinary ray using Calcite Prism
6. Ultrasonic diffraction using quartz crystal
7. Linear expansion of metal using parallel fringes
8. Diffraction LASER due to single slit
9. Michelson interferometer
10. Diffraction of LASER beam due to double slit

Note: Any 8 experiments are to be performed by each student

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PHYS05332 MICROPROCESSOR LAB

1. Load resistor A ,B ,C , D with the same constants
2. Sum of two numbers
3. Subtraction of two numbers
4. To interchange the data at the two locations
5. Increment data by one
6. Sum of four numbers in memory locations

MASM PROGRAMS

7. Addition of two 8-bit numbers
8. Addition of two 16-bit numbers
9. Addition with carry(ADC)
10. ASCII adjust after addition (AAA)
11. Decimal adjust for addition (DAA)
12. Subtraction of two 8-bit numbers
13. Subtraction of two 16-bit numbers
14. Subtract with borrow(SBB)
15. Decimal adjust for subtraction (DAS)
16. Multiplication of two numbers (8-bit)
17. Multiplication of two numbers (16-bit)
18. Signed multiplication (IMUL)
19. ASCII adjust after multiplication (AAM)
20. Division of two numbers(8-bit)
21. Division of two numbers(16-bit)
22. Signed division (IDIV)
23. Addition of 10 conjugative numbers
24. Conversion of packed numbers to the unpacked numbers
25. To print the multiplication table
26. Factorial of a given number
27. Largest number in an array
28. Given number is even or odd
29. Addition of two matrices (16-bit)
30. Insert a character at the end of string

Note: Any 8 experiments are to be performed by each student

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L	T	P	C
4	0	0	4

PHYS05401 NUCLEAR AND PARTICLE PHYSICS

UNIT I: Nuclear Forces

Properties of Nuclear forces – Non central forces, Exchange forces and tensor forces- Meson theory of nuclear forces- Nucleon – nucleon scattering- Effective range theory – Spin dependence of nuclear forces – Isospin formalism.

UNIT II: Nuclear Reactions

Direct and compound nuclear reaction mechanisms – Cross sections in terms of partial wave amplitudes – Compound nucleus – Scattering Matrix – Reciprocity theorem – Breit – Wigner one – level formula – Resonance scattering.

UNIT III: Nuclear Models

Liquid drop model – Bohr – Wheeler theory of fission – Experimental evidence for shell effects – Shell model – Spin – Orbit coupling – Magic numbers – Angular momenta and parities of nuclear ground states –estimate of transition rates(Qualitative) - magnetic moments and Schmidt lines- Collective model of Bohr and Mottelson.

UNIT IV: Nuclear Decay

Beta decay – Fermi theory of beta decay –Total decay rate- Angular momentum and parity selection rules- Comparative half – lives – Allowed and forbidden transitions – Selection rules – Parity violation – Two component theory of neutrino decay – Detection and properties of neutrino.

UNIT V: Elementary Particle Physics

Types of interaction between elementary particles – Hadrons and leptons – Symmetry and conservation laws – Elementary ideas of CP and CPT invariance – Classification of hadrons Quark Model- bottom and top quarks, Electromagnetic structure of nucleons.

Text Books:

1. Nuclear Physics, Tayal
2. I.Kaplan, Nuclear Physics, 2nd Ed., Narosa, Madras, 1989.

Reference Books:

1. Introductory Nuclear Physics by W.Wong.
2. Introductory Nuclear Physics by S.B.Patel.

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PHYS05402 FIBER OPTIC SENSORS

UNIT I: Intensity Modulated Sensors
General features, intensity modulation through interruption, shutter/sehliren multimode fiber Optic sensors, Reflective fiber optic sensors, Evanescent – Wave fiber sensors, Microband sensors, Fiber Optic refractometers, Intensity modulated fiber optic thermometers, chemical analysis, Distributed sensing with fiber optics.

UNIT II: Interferometric Sensors
Basic principles of interferometric optical fiber sensors, Applications of interferometric optical fiber sensors, components for interferometric sensors, Future trends in interferometric sensors.

UNIT III: Fused Single Mode Couplers
Introduction, physical principles, polarization effects, Experimental properties- Wavelength dependence, dependence on external refractive index, Theoretical modeling - Qualitative behavior, first approximation, second approximation, comparison with experiment, dependence on external refractive index.

UNIT IV: Single – Mode All Fiber Components
Directional, couplers, fused single mode couplers, polished single mode couplers, polarization splitters, polarization controllers, optical isolators, single mode fiber filters.

UNIT V: Signal Processing in Mono-mode Fiber Optic Sensor Systems
Transduction mechanisms – sensor transfer function, Phase modulated sensors, polarization modulated sensors, Optical processing – Two beam Interferometer, Multiple beam interferometer.

Text Books:

1. Fundamentals of Fiber Optics in Telecommunications and sensor systems - Edited by Bishnu P. Pal.
2. Introduction to fiber Optics by Ajoy Ghatak and K. Thyagarajan

Reference Books:

1. Fiber-Optic Communications Technology by Djafar K. Mynbaev, Lowell L. Scheiner

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PHYS05403 OPTICAL COMMUNICATION

UNIT I: Basics of Communication System

Historical Perspective-The Measurement of Information and the capacity of a Tele communication Channel- Communication system Architecture -Optical communication system - Sources for longer wavelengths - The reliability of DH Semiconductor LED's and Lasers.

UNIT II: Semiconductor Photodiode Detectors

General Principles-Intrinsic Absorption -Quantum Efficiency -Materials and Designs for p-i-n photodiode -Impulse and frequency response of a p-i-n photodiodes -Noise in p-i-n photodiodes -Avalanche Photo Diode Detectors: The Multiplication process- APD Designs - APD Band widths - APD Noise.

UNIT III: Signal Amplification & Regeneration

The Receiver Amplifier- Introduction- Sources of Receiver Noise - Circuits, Devices & Definitions - The voltage Amplifier circuits - The Trans Impedance Feedback Amplifier.
The Regeneration of Digital signals - Causes of Regeneration error - The Quantum Limit to Detection - The effect of Amplifier & Thermal Noise on the Error probability-
Noise Penalties in Practical systems.

UNIT IV: Unguided Communication Systems

Introduction-Transmission parameters – Sources: Neodymium lasers, Carbon dioxide laser sources – Detectors: photomultiplier tubes at shorter wavelengths, detectors for longer wavelengths, use of heterodyne detection- Examples of unguided optical communication systems: Terrestrial systems, Proposed optical communication systems for communication in near space.

UNIT V: Optical Fiber Communication System

Introduction- the Economic Merits of optical fiber system - Optical Fiber Digital Telecommunication systems: First generation, second generation systems - Analogue systems - Applications in Local Data Communication Systems- The wired city.

Text Books:

1. Optical Communication System, John. Gowar.
2. Optical Fiber Communications, John M Senior.

Reference Books:

1. Fiber optic communication systems by Govind P.Agrawal.

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PHYS05404E C++ AND DATA STRUCTURES

UNIT I: Introduction To Object Oriented Programming (OOP)
Problems with Procedural languages, Basic concepts of OOP. Beginning with C++ - tokens, expressions, control structures. Functions in C++. Arrays and Pointers.

UNIT II: Oops Concepts
Classes and objects. Constructors and destructors. Polymorphism - operator overloading, Function overloading. Inheritance , forms of inheritance.

UNIT III: Stacks and Queues
Stack- understanding stacks, primary stack operations, Implementing stack class in C++, stack class member functions, Applications of stacks examples- Queues and priority queues: understanding primary Queue operations, Implementing queue class in C++.

Unit IV: Linked lists & Trees
Understanding links, Link class and member functions, Implementing link class in c++. Implementing stacks and queue using linked lists.
Trees : tree terminology, representing the tree in c++, the node class and the tree class, traversing binary trees, c++ code for tree traversal, Implementing a binary search tree in c++, examples.

UNIT V: Searching & Sorting
Searching and sorting algorithms: Linear search algorithm, binary search algorithm, Bubble sort, shell sort algorithms.

Text Books:
1. Object Oriented Programming with C++, E Balaguruswamy, Tata McGraw Hill publishing company.

Reference Books:

1. Programming with C++, John Hubbard, Schaum outlines, McGraw hill international.
2. Data structures and Algorithms in 24 hours, Robert Lafore, Techmedia.

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PHYS05405E PHYSICS OF SOLIDS

UNIT I: Bonding in solids

Cohesive Energy **–** Calculation of Cohesive Energy of Ionic Solids, Lattice energy of Ionic Crystals, Madelung constant. Lattice points and space lattice – Basic and Crystal structure – Unit cells and Lattice parameters – Unit cells and primitive cells crystal systems – Bravais lattices – Structures of Diamond, Zns, NaCl and CsO systems.

UNIT II: Crystal Directions, planes and Miller Indices

Important features of Miller Indices of crystal planes – Important planes in a cubic crystal – Distribution of atoms in the atoms, plane of a Simple Cubic crystal – Relation between inter planar spacing and lattice parameter – Allotropy and Polymorphism. Imperfections in Crystals - Point Defects – Frenkel and Schottky defects Energy of formation of a Vacancy –

UNIT III: Electron Theory of Metal

Classical Theory – Drawbacks of Classical theory Relaxation time, Collision time and mean free path – Quantum theory of free electron Fermi-Dirac statistics and Electronic distribution in solids – Density of Energy states an Fermi Distribution Function, Band theory of solids – Kronig –Penney Model – Motion of electron in a one dimensional periodic potential.

UNIT IV: Dielectric Properties

Microscopic Concept of Polarization, Sources of polarization Internal field – Clausius – Mosotti relation – Ferro electricity and Piezo-electricity Complex dielectric Constant and Dielectric Loss – Dielectrics in Alternating Fields important requirements of good insulating materials – Some important insulating material.

UNIT V: Semiconductors

Conductivity and temperatures Statistics electrons and holes in intrinsic semiconductors – Statistics of electrons and holes extrinsic semiconductors – electrical conductivity – Extrinsic semiconductors – Mechanic of conduction in semiconductors – Generation and recombination electrons and holes Mobility of Current Carriers – Hall effect.

Text Books:

1. Solid state physics, A.J.Dekher Macmillion, London
2. Introduction to Solid state physics, C.Kittel, VII Ed, John Willey & Sons, New York

Reference Books:

3. Introduction to Solids, L.Azaroff, New Age International (P) Publishers, New Delhi.
4. Solid State Physics, M. Keer, New Age International (P) Publishers, New Delhi.

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PHYS05406E INSTRUMENTATION

Unit I: Compositional and Structural Characterization Techniques

X-ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-ray analysis (EDAX), Principles and applications of X-ray diffraction: Electron diffraction, Electron probe microanalysis (EPMA), Ion beam techniques: SIMS & RBS.

Unit II: Surface Characterization Techniques

High resolution microscopy, Scanning electron microscopy (SEM), Transmission electron microscopy(TEM), Atomic force microscopy(AFM), Scanning tunneling microscopy(STM).

Unit III: Spectroscopic Techniques

Fourier Transform infrared (FTIR) spectroscopy, Raman spectroscopy techniques: micro Raman and laser Raman.

Unit IV: Electrical Characterization Techniques

Measurement of resistivity by 4-prob method, Hall measurement, Sebecek coefficient measurements, nano indentation techniques, electron beam induced current measurement (EBIC).

Unit V: Thermal and Magnetic Characterization

VSM, Thermal analysis, impedance and ferroelectric measurements.

Text Books:

1.Nano: The Essentials -Understanding Nano Scinece and Nanotechnology by T.Pradeep,
2.Introduction to Nano Technology by Charles. P. Poole Jr and Frank J. Owens,
3. A practical approach to X-Ray diffraction analysis by C.Suryanarayana

Reference Books:

1.Nanotechnology : Principles and Practices – Sulabha K. Kulkarni
2.Specimen preparation for Transmission Electron microscopy by John & Bravmno et al,

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PHYS05441 GENERAL PHYSICS LAB - 4

1. GM counter –characteristics
2. GM counter – range energy
3. GM counter - absorption co-efficient of a material
4. GM counter - inverse square law
5. Photo elastic constant
6. Raman Effect
7. Four probe method
8. Magnetic Susceptibility of a liquid
9. Constant deviation spectrometer
10. Thermo electric power

Note: Any 8 experiments are to be performed by each student

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PHYS05442 FIBER OPTICS LAB

1. Losses in optical fiber at 660nm and 850 nm
2. Characterization of 660nm and 850 nm LEDs
3. Angular misalignment
4. Longitudinal and lateral misalignment losses
5. Characterization of fiber optic phototransistor
6. Measurement of numerical aperture
7. Setting up of fiber optic voice link
8. Forming PC to PC communication link using optical fiber and RS-232 interface
9. Study of pulse width modulation and demodulation
10. Study of an eye pattern

Note: Any 8 experiments are to be performed by each student