

WEST BENGAL COUNCIL OF HIGHER SECONDARY EDUCATION
SYLLABUS FOR CLASSES XI AND XII
JOB ROLE: OPTICAL FIBER TECHNICIAN

COURSE OVERVIEW

Business Optical fiber technician is responsible for maintaining uptime and quality of the network segment (both optical media & equipment) assigned to him by undertaking periodic preventive maintenance activities and ensuring effective fault management in case of fault occurrence. He is also required to coordinate activities for installation and commissioning of Optical Fibre Cable (OFC) as per the route plan.

This job requires the individual to work closely with multiple teams and operate in field which may consist of difficult terrain. The individual should be able to handle high pressure situations and be analytical to successfully perform the assigned responsibilities. It is preferred that individual is well versed with local language to coordinate with local labors.

COURSE OUTCOME:

On completion of the course, students should be able to:

- ✓ Apply effective oral and written communication skills to interact with people and customers;
- ✓ Identify the principal components of a computer system;
- ✓ Demonstrate the basic skills of using computer;
- ✓ Demonstrate self-management skills;
- ✓ Demonstrate the ability to provide a self-analysis in context of entrepreneurial skills and abilities;
- ✓ Demonstrate the knowledge of the importance of green skills in meeting the challenges of sustainable development and environment protection;
- ✓ Acquaint self with facets of trenching, laying, jointing and blowing of cables by: authenticating and confirming cable drum is placed near site, cable marking is as per guideline, trenching is according to the route plan
- ✓ Comprehend inspecting criteria of route plan, clearance, schedule and patrolling by: acquiring route plans, their clearance and check for safety of the site for cable installation
- ✓ Identify importance of fault maintenance, maintenance of POPs and
- ✓ Repairs to OFC by: compliance to enterprise policy, coordinate with
- ✓ NOC and carry out planned maintenance.
- ✓ Aggregate potential knowledge and skill to vouchsafe the importance of health and safety by: safeguard compliance of safety regulations, personal protection and environmental conditions.

- ✓ Comprehend and initiate the importance of report and record by: ensuring cable id, cable markings, drum numbers, OTDR findings are Documented for future reference.

COURSE STRUCTURE

JOB ROLE: OPTICAL FIBER TECHNICIAN

SECTOR: TELECOM

Class	Semester	Contact Hours						Marks		
		Employability Skills	Domain Theory	Domain Practical	Practical Exam	Project	Total	Theory		Practical
XI	I	70	35	50	-	-	155	30	Average of Sem I & Sem II = 30	NIL
	II	40	35	45	10	15	145	30		50 + 20 = 70
XII	III	70	32	43	-	-	145	30	Average of Sem III & Sem IV = 30	NIL
	IV	40	40	50	10	15	155	30		50 + 20 = 70

JOB ROLE: OPTICAL FIBER TECHNICIAN**Class XI [Total Theory Marks 30]****Class XI SEMESTER 1 TOPICS: (MCQ) MARKS: 30 [1 MARK PER QUESTION]**

SL No.	Topic	Tuition Hours	Marks Allotted
	Part A: Employability Skills	70	
1	Unit 1: Communication Skills – III	25	2
2	Unit 2: Self-management Skills – III	25	2
3	Unit 3: Basic ICT Skills – III	20	2
	Part B: Vocational Skills	85	
4	Unit 1: Fundamentals of optical fiber technology	45	12
5	Unit 2: Tools and equipment and safety precautions	40	12
	Total	155	30

Class XI SEMESTER 2 TOPICS: [Short Answer Question, Descriptive Question] MARKS: 30

SL No.	Topic & Sub-Topics	Tuition Hours	Short Answer Type Question (10 Marks)	Descriptive Type Question (20 Marks)	Total
	Part A: Employability Skills	40			
1	Unit 4: Entrepreneurial Skills - III	25	1	2	3
2	Unit 5: Green Skills - III	15	1	2	3
	Part B: Vocational Skills	80			
3	Unit 3: Installation of optical fiber cable (OFC)	40	4	8	12
4	Unit 4: Optical Fiber Health & Safety	40	4	8	12
	Part C: Practical Work	10			
5	Practical Examination	06			
6	Written Test	01			
7	Viva Voce	03			
	Part D: Project Work/Field Visit	15			
8	Practical File/ Student Portfolio	10			
9	Viva Voce	05			
	Total	145	10	20	30

JOB ROLE: OPTICAL FIBER TECHNICIAN**Class XII [Total Theory Marks 30]****Class XII SEMESTER 3 TOPICS: (MCQ) MARKS: 30 [1 MARK PER QUESTION]**

SL No.	Topic	Tuition Hours	Marks Allotted
	Part A: Employability Skills	70	
1	Unit 1: Communication Skills - IV	25	2
2	Unit 2: Self-management Skill - IV	25	2
3	Unit 3: Basic ICT Skills - IV	20	2
	Part B: Vocational Skills	85	
4	Unit 1: Introduction to Optical Fiber Industry	30	11
5	Unit 2: Optical Fibre Cable and Tools	45	13
	Total	145	30

Class XII SEMESTER 4 TOPICS: [Short Answer Question, Descriptive Question] MARKS: 30

SL No.	Topic & Sub-Topics	Tuition Hours	Short Answer Type Question (10 Marks)	Descriptive Type Question (20 Marks)	Total
	Part A: Employability Skills	40			
1	Unit 4: Entrepreneurial Skills - IV	25	1	2	3
2	Unit 5: Green Skills - IV	15	1	2	3
	Part B: Vocational Skills	75			
3	Unit 3: Installation of Optical Fiber Cable	45	4	8	12
4	Unit 4: Fault Restoration, Safety Measures and Networking	45	4	8	12
	Part C: Practical Work	10			
5	Practical Examination	06			
6	Written Test	01			
7	Viva Voce	03			
	Part D: Project Work/Field Visit	15			
8	Practical File/ Student Portfolio	10			
9	Viva Voce	05			
	Total	155	10	20	30

DETAIL SYLLABUS
CLASS - XI
SEMESTER – I

Part A: Employability Skills			
Unit 1: Communication Skills – III			
Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	Duration (25 Hrs)
1. Demonstrate knowledge of various methods of communication	<ul style="list-style-type: none"> • Methods of communication • Verbal • Non-verbal • Visual 	<ul style="list-style-type: none"> • Writing pros and cons of written, verbal and non-verbal communication • Listing do's and don'ts for avoiding common body language mistakes 	05
2. Identify specific communication styles	<ul style="list-style-type: none"> • Communication styles- assertive, aggressive, passive- aggressive, submissive, etc. 	<ul style="list-style-type: none"> • Observing and sharing communication styles of friends, teachers and family members and adapting the best practices • Role plays on communication styles. 	10
3. Demonstrate basic writing skills	<ul style="list-style-type: none"> • Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph 	<ul style="list-style-type: none"> • Demonstration and practice of writing sentences and paragraphs on topics related to the subject 	10
Unit 2: Self-management Skills – III			
Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	Duration (25 Hrs)
1. Demonstrate impressive appearance and grooming	<ul style="list-style-type: none"> • Describe the importance of dressing appropriately, looking decent and positive body language. • Describe the term grooming • Prepare a personal grooming checklist. • Describe the techniques of self- exploration. 	<ul style="list-style-type: none"> • Demonstration of impressive appearance and groomed personality. • Demonstration of the ability to self- explore. 	07
2. Demonstrate team work skills	<ul style="list-style-type: none"> • Describe the important factors that influence in team building. • Describe factors influencing team work. 	<ul style="list-style-type: none"> • Group discussion on qualities of a good team. • Group discussion on strategies that are adopted for team building and team work. 	08

3. Apply time management strategies and techniques	<ul style="list-style-type: none"> • Meaning and importance of time management – setting and prioritizing goals, creating a schedule, making lists of tasks, balancing work and leisure, using different optimization tools to break large tasks into smaller tasks. 	<ul style="list-style-type: none"> • Game on time management. • Checklist preparation. • To-do-list preparation. 	10
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Unit 3: Basic ICT Skills - III

Learning Outcome	Theory (08 Hours)	Practical (12 Hours)	Duration (20 Hrs)
1. Create a document on word processor	<ul style="list-style-type: none"> • Introduction to word processing. • Software packages for word processing. • Opening and exiting the word processor. • Creating a document 	<ul style="list-style-type: none"> • Demonstration and practice of the following: • Listing the features of word processing, • Listing the software packages for word processing, • Opening and exit the word processor, • Creating a document 	10
2. Edit, save and print a document in word processor	<ul style="list-style-type: none"> • Editing text • Wrapping and aligning the text • Font size, type and face. • Header and Footer • Auto correct • Numbering and bullet • Creating table • Find and replace • Page numbering. • Printing document. • Saving a document in various formats 	<ul style="list-style-type: none"> • Demonstration and practicing the following: • Editing the text • Word wrapping and alignment, • Changing font type, size and face, • Inserting header and footer, • Removing header and footer, • Using autocorrect option, • Insert page numbers and bullet, • Save and print a document. 	10

Part B: Vocational Skills

Unit 1: Fundamentals of Optical Fiber Technology

Learning Outcome	Theory (20 Hours)	Practical (25 Hours)	Duration (45 Hrs)
1. Appreciate the basics of fiber optics	<ul style="list-style-type: none"> • History and evolution of fiber optics, • Advantages/disadvantages of fiber optics, • Basics of a fiber optic communications system • Fiber optic standards • Applications of fiber optics • Common industry terminology. 	<ul style="list-style-type: none"> • List the opportunities in the broadband industry, • Demonstrate the role of optical fiber technician, • Prepare the duties and responsibilities of optical fiber technician, • Gather the knowledge, skills and attitudes required by the optical fiber technician. 	10
2. Understand the concept of light	<ul style="list-style-type: none"> • Nature of light • Propagation characteristics 	<ul style="list-style-type: none"> • Demonstrate an experiment for proration of light, 	15

propagation	<ul style="list-style-type: none"> of light, Electromagnetic spectrum, Snell's law, critical angle Reflection, Refraction, Total internal reflection, Refractive index, Acceptance angle, Acceptance cone, Numerical aperture. 	<ul style="list-style-type: none"> Verify the laws of reflection and refraction, total internal reflection, Demonstrate the experiment to determine numerical aperture. 	
3. Describe the types of optical fiber	<ul style="list-style-type: none"> Structure of optical fiber, Fiber optic – glass fibers, plastic fibers, fiber sizes, Types of fiber based on modes of propagation – single mode and multi-mode fiber, step index and graded index fiber, Fiber Specifications Attenuation and dispersion. 	<ul style="list-style-type: none"> Identify and name different types of cables used in transmission media, Draw the diagram of cable and name the different parts of cable. 	10
4. Describe the types of optical fiber cable	<ul style="list-style-type: none"> Different types of cables used in transmission media, Structure of cable – types of buffering, Types of cables – Indoor cables, outdoor cables, Types of cables – cordage, distribution cable, breakout cable, Armored cable, messenger cable, ribbon cable, submarine cable, short and long run cables, hybrid, composite cables. 	<ul style="list-style-type: none"> Identify and name the various types of cable. 	10

Unit 2: Tools, Equipment and Components

Learning Outcome	Theory (15 Hours)	Practical (25 Hours)	Duration (40 Hrs)
1. Describe the light sources of optical fiber	<ul style="list-style-type: none"> Structure of LED, PN Junction, Types of LED – surface emitting LED, Edge emitting LED LED materials, Uses of LED, Advantages and disadvantages of LED, Fiber-LED coupling, LASERS diode operation, Types of LASERS diodes, Uses of LASER, Comparison of LED and LASER diodes. PIN diode 	<ul style="list-style-type: none"> Identify and list different types of LED, Identify the material using LED, Demonstrate an experiment to show difference between LASER diode light and white light components, Demonstrate to use different sources for light propagation through the fibers. Demonstrate the laser beam absorption as a function of filter colour and its coherent nature 	10
2. Identify and use fiber optic tools in	<ul style="list-style-type: none"> Basic Hand Tools- screwdriver. cable cutting 	<ul style="list-style-type: none"> Identify and name the tools in fiber optics tool kit, 	20

<p>tool kit</p>	<p>knife, Plier, scissors. Round tube cutter, Electrical tape, optical fiber stripper</p> <ul style="list-style-type: none"> • Splicing tools- optical fiber splicing machine, cleaver (scribe and precision), protection sleeve, mechanical splice connector, Matching Gel, clamp spring • Cleaning Tools-Cleaning swab, gloves. Tissue paper, Isopropyl alcohol • Testing tools – OTDR • Termination Kit- Optical connectors and its type • Tools for installing cables- Tubing cutter, Rotary cable slitting and ringing tool, cable jacket stripper, Buffer tube stripper 	<ul style="list-style-type: none"> • Demonstrate the handling of the tools – • Tubing cutter tool, • Rotary cable slitting tool, • Cable jacket stripper tool, • Fiber optics stripper tool, • Buffer tube stripper tool, • Scissors tool, • Scribe tool, • pliers • OTDR, • Demonstrate the various types of connectors 	
<p>3. Describe the specification of optical fiber cable</p>	<ul style="list-style-type: none"> • Describe fiber optic cable specification – tensile strength, bend radius, crush and impact 	<ul style="list-style-type: none"> • To understand optical fibre's tensile strength • Study bend radius of a cable. 	<p>10</p>

DETAIL SYLLABUS
CLASS - XI
SEMESTER – II

Part A: Employability Skills			
Unit 4: Entrepreneurial Skills – III			
Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	Duration (25 Hrs)
1. Describe the significance of entrepreneurial values and attitude.	<ul style="list-style-type: none"> • Values in general and entrepreneurial values. Entrepreneurial value orientation with respect to inattentiveness, independence, outstanding performance and respect for work. 	<ul style="list-style-type: none"> • Listing of entrepreneurial values by the students. • Group work on identification of entrepreneurial values and their roles after listing or reading 2-3 stories of successful entrepreneur. • Exhibiting entrepreneurial values in Ice breaking, rapport building, group work and home assignments. 	10
2. Demonstrate the knowledge of attitudinal changes required to become an entrepreneur.	<ul style="list-style-type: none"> • Attitudes in general and entrepreneurial attitudes • Using imagination/ intuition • Tendency to take moderate risk • Enjoying freedom of expression and action • Looking for economic opportunities • Believing that we can change the environment • Analyzing situation and planning action • Involving in activity 	<ul style="list-style-type: none"> • Preparing a list of factors that influence attitude in general and entrepreneurial attitude. • Demonstrating and identifying own entrepreneurial attitudes during the following micro lab activities like thematic appreciation test. • Preparing a short write-up on “who am I”. • Take up a product and suggest how its features can be improved. • Group activity for suggesting brand names, names of enterprises, etc. 	15
Unit 5: Green Skills – III			
Learning Outcome	Theory (07 Hours)	Practical (08 Hours)	Duration (15 Hrs)
1. Describe importance of main sector of green economy	<ul style="list-style-type: none"> • Main sectors of green economy- E-waste management, green transportation, renewal energy, green construction, water management. • Policy initiatives for greening economy in India. 	<ul style="list-style-type: none"> • Preparing a poster on any one of the sectors of green economy. • Writing a two-page essay on important initiatives taken in India for promoting green economy. 	08

2. Describe the major green Sectors/ Areas and the role of various stakeholder in green economy	<ul style="list-style-type: none"> Stakeholders in green economy. Role of government and private agencies in greening cities, buildings, tourism, industry, transport, renewable energy, waste management, agriculture, water, forests and fisheries. 	<ul style="list-style-type: none"> Preparing posters on green Sectors/Areas: cities, buildings, tourism, industry, transport, renewable energy, waste management, agriculture, water, forests and fisheries. 	07
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Part B: Vocational Skills

Unit 3: Installation of optical fiber cable (OFC)

Learning Outcome	Theory (15 Hours)	Practical (25 Hours)	Duration (40 Hrs)
1. Testing of optical fibre cables by conditional maintenance and planned repair activities	<ul style="list-style-type: none"> Testing preparation Testing optical fibre -visual fault locator, Inspection microscope Visual connector inspection Connector end cleaning procedure Cleaning fibre ends Bare fibre test Optical return loss test Methods for measuring return loss Optical time domain reflectometers (OTDRs) Elements of OTDR. OTDR specification Fibre optic power meters Light source Insertion loss tests 	<ul style="list-style-type: none"> Procedure to check the continuity of the optical fibre cable with Visual Fault Inspector Working with the inspection microscope The steps to be followed for visual connector inspection Methods for measuring return loss using OTDR To study trace of OTDR Demonstrate the bare fiber test. To test insertion loss in optical fibre 	10
2. Carrying out splicing in optical fibres	<ul style="list-style-type: none"> Requirement of splicing: Parameters to be considered to perform splicing Types of splicing- Fusion splicing, Mechanical splicing Selecting the splicing method Testing of splicing Splice problem troubleshooting 	<ul style="list-style-type: none"> Demonstrate the process of splicing Demonstrate the working with the splicing machine Demonstrate the testing of the parameters of splicing 	20
3. Follow safety in handling tools	<ul style="list-style-type: none"> Safety precautions in handling optical fibre, Safety precautions in handling optical laser, Bare fiber safety Safety precautions related to optical fibre fire safety, Precautions for optical fibre workmanship safety, 	<ul style="list-style-type: none"> Demonstrate the safety precautions in handling optical fibre, Demonstrate the safety precautions in handling optical laser, Demonstrate the safety precautions related to optical fibre fire safety, List the precautions for optical 	10

	<ul style="list-style-type: none"> • Safety in handling equipment of optical fibre, • Important safety guidelines for workman, • Cleanliness and safe work surroundings. 	fibre workmanship safety, <ul style="list-style-type: none"> • Demonstrate to handle the tools and equipment safely, • List the important safety guidelines for workman, • Demonstrate the cleanliness and safe work surroundings. • Demonstrate the first aid 	
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Unit 4: Optical Fiber Health & Safety

Learning Outcome	Theory (20 Hours)	Practical (20 Hours)	Duration (40 Hrs)
1. Read and interpret OFC route plan	<ul style="list-style-type: none"> • OFC route plan, • Route inspection, • Route diagrams, • Different site condition. • Advantages of an effective rout inspection 	<ul style="list-style-type: none"> • Identify the appropriate site conditions for cable laying • Draw the route plan for given site conditions, • Draw the route diagram for given site conditions. 	10
2. Inspect the site for safe and secure cable installation	<ul style="list-style-type: none"> • Safety and security of site • Various parameters to inspect the site 	<ul style="list-style-type: none"> • Draw the cable laying plan for the proposed site • Identify the various parameters to ensure safety and security of site for cable laying. 	10
3. Link performance analysis	<ul style="list-style-type: none"> • The fibre optic link, • Link power budget, • Optical technologies – FTTX • Fibre in home cabling reference model, • Multiplexing. 	<ul style="list-style-type: none"> • Calculate optical fibre link loss budget • Measure propagation or attenuation loss in optical fibre. • Measure the bending loss in fibre. • Measure propagation loss in optical fibre using optical power meter. • Install a Fibre broadband in your house. 	20

DETAIL SYLLABUS
CLASS - XII
SEMESTER – III

Part A: Employability Skills			
Unit 1: Communication Skills – IV			
Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	Duration (25 Hrs)
1. Describe the steps to active listening skills	<ul style="list-style-type: none"> • Importance of active listening at workplace • Steps to active listening. 	<ul style="list-style-type: none"> • Demonstration of the key aspects of becoming active listener. • Preparing posters of steps for active listening. 	10
2. Demonstrate basic writing skills	<ul style="list-style-type: none"> • Writing skills to the following: • Sentence • Phrase • Kinds of Sentences • Parts of Sentence • Parts of Speech • Articles • Construction of a Paragraph 	<ul style="list-style-type: none"> • Demonstration and practice of writing sentences and paragraphs on topics related to the subject. 	15
Unit 2: Self-management Skills – IV			
Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	Duration (25 Hrs)
1. Describe the various factors influencing self-motivation	<ul style="list-style-type: none"> • Finding and listing motives (needs and desires); • Finding sources of motivation and inspiration (music, books, activities); expansive thoughts; living fully in the present moment; dreaming big. 	<ul style="list-style-type: none"> • Group discussion on identifying needs and desire. • Discussion on sources of motivation and inspiration. 	10
2. Describe the basic personality traits, types and disorders	<ul style="list-style-type: none"> • Describe the meaning of personality. • Describe how personality influence others. • Describe basic personality traits. • Describe common personality disorders- paranoid, antisocial, schizoid, borderline, narcissistic, avoidant, dependent and obsessive. 	<ul style="list-style-type: none"> • Demonstrate the knowledge of different personality types. 	15
Unit 3: Basic ICT Skills-IV			
Learning Outcome	Theory (06 Hours)	Practical (14 Hours)	Duration (20 Hrs)
1. Perform tabulation using spreadsheet application	<ul style="list-style-type: none"> • Introduction to spreadsheet application, • Spreadsheet applications, • Creating a new worksheet, 	<ul style="list-style-type: none"> • Demonstration and practice on the following: • Introduction to the spreadsheet application, 	10

	<ul style="list-style-type: none"> • Opening workbook and entering text, • Resizing fonts and styles, • Copying and moving, • Filter and sorting, • Formulas and functions, • Password protection, • Printing a spreadsheet, • Saving a spreadsheet in various formats. 	<ul style="list-style-type: none"> • Listing the spreadsheet applications, • Creating a new worksheet, • Opening the workbook and enter text, • Resizing fonts and styles, • Copy and move the cell data, • Sorting and Filter the data, • Applying elementary formulas and functions, • Protecting the spreadsheet with password, • Printing a spreadsheet, • Saving the spreadsheet in various formats. 	
2. Prepare presentation using presentation application	<ul style="list-style-type: none"> • Introduction to presentation, • Software packages for presentation, • Creating a new presentation, • Adding a slide, • Deleting a slide, • Entering and editing text, • Formatting text, • Inserting clipart and images, • Slide layout, • Saving a presentation, • Printing a presentation document. 	<ul style="list-style-type: none"> • Demonstration and practice on the following: • List the software packages with features for presentation, • Creating a new presentation, • Adding a slide to presentation, • Deleting a slide, • Entering and edit text, • Formatting text, • Inserting clipart and images, • Sliding layout, • Saving a presentation, • Printing a presentation. 	10

Part B: Vocational Skills

Unit 1: Introduction to Optical Fiber Industry

Learning Outcome	Theory (12 Hours)	Practical (18 Hours)	Duration (30 Hrs)
1. Understand the opportunities in the broadband industry	<ul style="list-style-type: none"> • Opportunities in the broadband industry – global and local scenario, • Role of optical fiber technician in telecom industry, • Duties and responsibilities of optical fiber technician, • Knowledge, skills and attitudes required by the optical fiber technician, • Public switched telephone network (PSTN), • History and evolution of fiber optic communication, • Transmission media, Important telecom terminologies, • Advantages of fiber optic communication in telecom 	<ul style="list-style-type: none"> • List the opportunities in the broadband industry, • Demonstrate the role of optical fiber technician • Prepare the duties and responsibilities of optical fiber technician, • Gather the knowledge, skills and attitudes required by the optical fiber technician. • Setting up the call in PSTN, • Identify and name the various transmission media. 	10

	industry.		
2. Read and interpret OFC route plan	<ul style="list-style-type: none"> • OFC route plan, • Route inspection, • Route diagrams, • Different site condition. 	<ul style="list-style-type: none"> • Identify the appropriate site conditions for cable laying • Draw the route plan for given site conditions, • Draw the route diagram for given site conditions. 	10
3. Inspect the site for safe and secure cable installation	<ul style="list-style-type: none"> • Cable laying process in the various site conditions • Safety and security of site • Various parameters to inspect the site` 	<ul style="list-style-type: none"> • Draw the cable laying plan for the proposed site • Identify the various parameters to ensure safety and security of site for cable laying. 	10

Unit 2: Optical Fibre Cable and Tools s

Learning Outcome	Theory (20 Hours)	Practical (25 Hours)	Duration (45 Hrs)
1. Describe the types of optical fiber	<ul style="list-style-type: none"> • Structure of optical fiber, • Fiber optic – glass fibers, plastic fibers, fiber sizes, • Types of fiber based on modes of propagation – single mode and multi-mode fiber, step index and graded index fiber, • Fiber Specifications • Attenuation and dispersion. 	<ul style="list-style-type: none"> • Identify and name different types of cables used in transmission media, • Draw the diagram of cable and name the different parts of cable. 	10
2. Describe the types of optical fiber cable	<ul style="list-style-type: none"> • Different types of cables used in transmission media, • Structure of cable – types of buffering, • Types of cables – Indoor cables, outdoor cables, • Types of cables – cordage, distribution cable, breakout cable, Armored cable, messenger cable, ribbon cable, submarine cable, short and long run cables, hybrid, composite cables. • NEC Standards for optical fiber • Cable markings and Color codes in optical fiber cables. 	<ul style="list-style-type: none"> • Identify and name the various types of cable. • Demonstrate the color-coding scheme for individual Fibers bundled in a cable. • measuring out a length of cable using sequential markings. 	15
3. Understand fibre optic cable specification	<ul style="list-style-type: none"> • Fiber optic cable, • Fibre optic cable specification – tensile strength, bend radius, crush and impact, Diameter • Cable duty specifications 	<ul style="list-style-type: none"> • Demonstrate the optical fibre’s specification -strength, minimum bend radius of a cable 	05
4. Identify and use fiber optic tools in tool kit	<ul style="list-style-type: none"> • Basic Hand Tools- screwdriver. cable cutting knife, Plier, scissors. Round tube cutter, Electrical tape, 	<ul style="list-style-type: none"> • Identify and name the tools in fiber optics tool kit, • Demonstrate the handling of the tools – 	15

	<p>optical fiber stripper</p> <ul style="list-style-type: none"> • Splicing tools- optical fiber splicing machine, cleaver (scribe and precision), protection sleeve, mechanical splice connector, Matching Gel, clamp spring • Cleaning Tools-Cleaning swab • Tissue paper, Isopropyl alcohol • Testing tools-OTDR • Tools for installing cables- Tubing cutter, Rotary cable slitting and ringing tool, cable jacket stripper, Buffer tube stripper • Termination kit -connectors and its types. • use of various tools and equipment for cable laying process • Optical Spectrum Analyzer and its type. 	<ul style="list-style-type: none"> • Tubbing cutter tool, • Rotary cable slitting tool, • Cable jacket stripper tool, • Fiber optics stripper tool, • Buffer tube stripper tool, • scissors tool, • Scribe tool, • plier • OTDR, • Procedure to use various tools and equipment for cable laying process • Identify the various types of connectors • Demonstrate to handle tools and equipment with safety and care • Identify the various tools and equipment used for cable laying process, • Identify the various types of connectors, • Demonstrate to use the various tools for splicing and cable laying, • Demonstrate the spectrum analyzer 	
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DETAIL SYLLABUS
CLASS - XII
SEMESTER – IV

Part A: Employability Skills			
Unit 4: Entrepreneurial Skills – IV			
Learning Outcome	Theory (10 Hours)	Practical (15 Hours)	Duration (25 Hrs)
1. Identify the general and entrepreneurial behavioral competencies	<ul style="list-style-type: none"> • Barriers to becoming entrepreneur. • Behavioral and entrepreneurial competencies – adaptability/decisiveness, initiative/perseverance, interpersonal skills, organizational skills, stress management, valuing service and diversity. 	<ul style="list-style-type: none"> • Administering self-rating questionnaire and score responses on each of the competencies. • Collect small story/ anecdote of prominent successful entrepreneurs. • Identify entrepreneurial competencies reflected in each story and connect it to the definition of behavioral competencies. • Preparation of competency profile of students. 	10
2. Demonstrate the knowledge of self-assessment of behavioral competencies	<ul style="list-style-type: none"> • Entrepreneurial competency in particular: self-confidence, initiative, seeing and acting on opportunities, concern for quality, goal setting and risk taking, problem solving and creativity, systematic planning and efficiency, information seeking, persistence, influencing and negotiating, team building. 	<ul style="list-style-type: none"> • Games and exercises on changing entrepreneurial behavior and development of competencies for enhancing self-confidence, problem solving, goal setting, information seeking, team building and creativity. 	15
Unit 5: Green Skills – IV			
Learning Outcome	Theory (05 Hours)	Practical (10 Hours)	Duration (15 Hrs)
1. Identify the role and importance of green jobs in different sectors	<ul style="list-style-type: none"> • Role of green jobs in toxin-free homes. • Green organic gardening, public transport and energy conservation, • Green jobs in water conservation. • Green jobs in solar and wind power, waste reduction, reuse and recycling of wastes, • Green jobs in green tourism • Green jobs in building and construction. • Green jobs in appropriate technology. • Role of green jobs in 	<ul style="list-style-type: none"> • Listing of green jobs and preparation of posters on green job profiles. • Prepare posters on green jobs. 	15

	<p>Improving energy and raw materials use</p> <ul style="list-style-type: none"> • Role of green jobs in limiting greenhouse gas emissions • Role of green jobs minimizing waste and pollution • Role of green jobs in protecting and restoring ecosystems • Role of green jobs in support adaptation to the effects of climate change 		
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Part B: Vocational Skills

Unit 3: Installation of Optical Fiber Cable

Learning Outcome	Theory (20 Hours)	Practical (25 Hours)	Duration (45 Hrs)
1. Demonstrate to handle OFC cables	<ul style="list-style-type: none"> • Identify factors affecting fiber optic cable- Factors effecting fibre optic cable – natural and man made • Cable drum, • Cable storage and handling, • Inspection of the drum and cable. 	<ul style="list-style-type: none"> • Demonstrate the method of drum preparation, • Demonstrate the methods of cable storage and its handling. • Demonstrate the factors affecting the damage of cables 	15
2. Carry out cable laying	<ul style="list-style-type: none"> • Standard cable installation process, • Installation through trenching, aerial, • Ducting process, • Conduct figure 8' ing', • Cable pulling and blowing, • Fibre optic cable pull boxes, • OFC preparation- Cable • Jacket removal, Removal of jacket using wire stripper. 	<ul style="list-style-type: none"> • Demonstrate the method of trenching, • Demonstrate the method of aerial fiber cable installation • Demonstrate the procedure of cable pulling and cable blowing. • Demonstrate the methods of the cable preparation 	15
3. Post implementation of fiber cables after laying	<ul style="list-style-type: none"> • Splicing procedure • Fusion splicing process, • Mechanical splicing process, • Testing of splicing, • Troubleshooting splicing • OFC termination, • Splice trays, • Splice enclosures. 	<ul style="list-style-type: none"> • Demonstrate the fusion splicing process • Demonstrate the mechanical splicing process, • Test the splicing, • Troubleshoot the splicing • Demonstrate to install fibre optic cable in splice tray 	15

Unit 4: Fault Restoration, Safety Measures and Networking

Learning Outcome	Theory (20 Hours)	Practical (25 Hours)	Duration (45 Hrs)
1. Test OFC using visual fault locator	<ul style="list-style-type: none"> • Fault notification-guidelines, • Fault notification process, • Fault localization and restoration, 	<ul style="list-style-type: none"> • Demonstrarte the process of receiving the fault notification and restoration, • Demonstrate the different types 	15

	<ul style="list-style-type: none"> • Rectification, • Cable system faults, • Fault case of damage to an optical drop cable, • Results of investigation, • Reproduction of cable damage. 	<ul style="list-style-type: none"> • of fault in fibre optics cable, • Demonstrate to prepare the problem identification flowchart, • Demonstrate the underground fibre optic cable repair. 	
2. Observe safety measures during installation of OFC	<ul style="list-style-type: none"> • Material and chemical safety, • Underground safety, • Working safety, • Using personal protective equipment – helmet, eye and face protection. • LASER light safety, • Ladder safety, • Fiber safety in a trench. 	<ul style="list-style-type: none"> • Demonstrate to follow the rules in handling chemicals for OFC installation. • Use the personal protective equipment, • Demonstrate the use of different classes of LASER, • Demonstrate the use of ladder in trench. 	15
3. Optical networking	<ul style="list-style-type: none"> • Li – Fi Technology, • Free Space Optics (FSO), • Digital Television, • Closed Circuit Television. 	<ul style="list-style-type: none"> • Demonstrate the use of Li-Fi over Wi-Fi, • Demonstrate the working of Li-Fi Technology, • Demonstrate working of FSO, • Connecting an external device using an optical cable, • Connecting digital TV using an optical cable. • Demonstrate the working of CCTV camera. 	15

ORGANISATION OF FIELD VISITS

In a year, at least 3 field visits/educational tours should be organised for the students to expose them to the activities in the workplace.

Visit a optical fiber cable installation site and observe the following: Location, Site, Cable laying, splicing procedure, Cable installation, trenching, handling. During the visit, students should obtain the following information from the owner or the supervisor:

1. Installations, troubleshooting, and maintaining all fiber optic systems in businesses, homes, schools, and other organizations to ensure that they are working properly,
2. Measuring the signal strength of television, telephone and internet connections to ensure that there is adequate performance,
3. Creating sensors and performing inspections to make sure that the fiber optic systems do not have defects that could undermine performance,
4. Conducting regular inspections of the systems with the aim of locating and repairing any defects detected during the inspections,
5. Performing premises cabling and running fiber optic cables underground and underwater,
6. Determining solutions to any problems and issues that are preventing the fiber optic systems from performing optimally,
7. Constructing a proper splice case as well as preparing and maintaining records, diagrams and schematics relating to the splice case.