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Research and development on optical wavelength-division multiplexing (WDM) networks have matured considerably. While optics and electronics should be used appropriately for transmission and switching hardware, note that "intelligence" in any network comes from "software," for network control, management, signaling, traffic engineering, network planning, etc. The role of software in creating powerful network architectures for optical WDM networks is emphasized. Optical WDM Networks is a textbook for graduate level courses. Its focus is on the network-

ing aspects of optical networking, but it also includes coverage of physical layers in optical networks. The author introduces WDM and its enabling technologies and discusses WDM local, access, metro, and long-haul network architectures. Each chapter is self-contained, has problems at the end of each chapter, and the material is organized for self study as well as classroom use. The material is the most recent and timely in capturing the state-of-the-art in the fast-moving field of optical WDM networking.

The state of the art of modern lightwave system design Recent advances in light-

wave technology have led to an explosion of high-speed global information systems throughout the world. Responding to the growth of this exciting new technology, Lightwave Technology provides a comprehensive and up-to-date account of the underlying theory, development, operation, and management of these systems from the perspective of both physics and engineering. The first independent volume of this two-volume set, Components and Devices, deals with the multitude of silica and semiconductor-based optical devices. This second volume, Telecommunication Systems, helps readers understand the de-

sign of modern lightwave systems, with an emphasis on wavelength-division multiplexing (WDM) systems. * Two introductory chapters cover topics such as modulation formats and multiplexing techniques used to create optical bitstreams * Chapters 3 to 5 consider degradation of optical signals through loss, dispersion, and nonlinear impairment during transmission and its corresponding impact on system performance * Chapters 6 to 8 provide readers with strategies for managing degradation induced by amplifier noise, fiber dispersion, and various nonlinear effects * Chapters 9 and 10 discuss the engineering issues involved in the design of WDM systems and optical networks Each chapter includes problems that enable readers to engage and test their new knowledge to solve problems. A CD containing illuminating examples based on RSoft Design Group's award-winning OptSim optical communication system simulation software is included with the book to assist readers in understanding design issues. Finally, extensive, up-to-date references at the end of each chapter enable students and researchers to gather more information about the most recent technology breakthroughs and

applications. With its extensive problem sets and straightforward writing style, this is an excellent textbook for upper-level undergraduate and graduate students. Research scientists and engineers working in lightwave technology will use this text as a problem-solving resource and a reference to additional research papers in the field. Internet information (which is doubling every six months) travels through optical fibers. Today, optical fibers are being installed where a single fiber has the ability to carry information as much as 200 times faster than was possible just five years ago. This revolutionary capability is being achieved with technology known as wavelength division multiplexing (WDM). WDM technology relies on the fact that optical fibers can carry many wavelengths of light simultaneously without interaction between each wavelength. Thus, a single fiber can carry many separate wavelength signals or channels simultaneously. The communications industry is at the onset of new expansion of WDM technology necessary to meet the new demand for bandwidth. WDM Technologies: Optical Networks deals with the Networks facet of this field (present and future). Allows engi-

neers working in optical communications (from systems to components) to understand the principles and mechanics of each key component they deal with for optical system design Provides an excellent resource for engineers and researchers engaged in all aspects of fiber optic communications, such as optoelectronics, equipment/system design, and manufacturing Provides comprehensive coverage of key concepts in optical networks and their application in commercial systems

The rapid growth in communications and internet has changed our way of life, and our requirement for communication bandwidth. Optical networks can enable us to meet the continued demands for this bandwidth, although conventional optical networks struggle in achieving this, due to the limitation of the electrical bandwidth barrier. Flexgrid technology is a promising solution for future high-speed network design. To promote an efficient and scalable implementation of elastic optical technology in the telecommunications infrastructure, many challenging issues related to routing and spectrum allocation (RSA), resource utilization, fault management and quality of service provisioning must be ad-

dressed. This book reviews the development of elastic optical networks (EONs), and addresses RSA problems with spectrum fragment issues, which degrade the quality of service provisioning. The book starts with a brief introduction to optical fiber transmission system, and then provides an overview of the wavelength division multiplexing (WDM), and WDM optical networks. It discusses the limitations of conventional WDM optical networks, and discusses how EONs overcome these limitations. It presents the architecture of the EONs and its operation principle. To complete the discussion of network architecture, this book focuses on the different node architectures, and compares their performance in terms of scalability and flexibility. It reviews and classifies different RSA approaches, including their pros and cons. It focuses on different aspects related to RSA. The spectrum fragmentation is a serious issue in EONs, which needs to be managed. The book explains the fragmentation problem in EONs, discusses, and analyzes the major conventional spectrum allocation policies in terms of the fragmentation effect in a network. The taxonomies of the fragmentation manage-

ment approaches are presented along with different node architectures. State-of-the-art fragmentation management approaches are looked at. A useful feature of this book is that it provides mathematical modeling and analyzes theoretical computational complexity for different problems in elastic optical networks. Finally, this book addresses the research challenges and open issues in EONs and provides future directions for future research.

Modeling, Simulation, Design and Engineering of WDM Systems and Networks provides readers with the basic skills, concepts, and design techniques used to begin design and engineering of optical communication systems and networks at various layers. The latest semi-analytical system simulation techniques are applied to optical WDM systems and networks, and a review of the various current areas of optical communications is presented. Simulation is mixed with experimental verification and engineering to present the industry as well as state-of-the-art research. This contributed volume is divided into three parts, accommodating different readers interested in various types of networks

and applications. The first part of the book presents modeling approaches and simulation tools mainly for the physical layer (including transmission effects, devices, subsystems, and systems), whereas the second part features more engineering/design issues for various types of optical systems including ULH, access, and in-building systems. The third part of the book covers networking issues related to the design of provisioning and survivability algorithms for impairment-aware and multi-domain networks. Intended for professional scientists, company engineers, and university researchers, the text demonstrates the effectiveness of computer-aided design when it comes to network engineering and prototyping.

Written by a leading expert in the field, this book provides a comprehensive introduction to the fundamental concepts of transport and data networks. This resource examines backbone network architectures and functions. The evolution, key components, and techniques of telecommunication networks are presented, including voice and data transmission, fiber optic communication and optical link design. This book explores the photonic network

architecture and includes chapters on transport networks, synchronous optical networks, optical transport networks, and dense wavelength division multiplexing. Professionals are brought up-to-speed with the applications and architecture of next generation photonic networks, and are provided with references for all applicable standards. This book offers insight into reality technologies, including virtual reality, augmented reality, mixed reality, and telecommunication infrastructure challenges. Details on the photonic circuit switched network architecture and photonic packet switched core network are presented. The book concludes with a full treatment of the virtualization and software defined networking ecosystem as well as a discussion on future developments.

The third edition of Optical Networks continues to be the authoritative source for information on optical networking technologies and techniques. Componentry and transmission are discussed in detail with emphasis on practical networking issues that affect organizations as they evaluate, deploy, or develop optical networks. New updates in this rapidly changing technolo-

gy are introduced. These updates include sections on pluggable optical transceivers, ROADM (reconfigurable optical add/drop multiplexer), and electronic dispersion compensation. Current standards updates such as G.709 OTN, as well as, those for GPON, EPON, and BPON are featured. Expanded discussions on multimode fiber with additional sections on photonic crystal and plastic fibers, as well as expanded coverage of Ethernet and Multiprotocol Label Switching (MPLS). This book clearly explains all the hard-to-find information on architecture, control and management. It serves as your guide at every step of optical networking-- from planning to implementation through ongoing maintenance. This book is your key to thoroughly understanding practical optical networks. In-depth coverage of optimization, design, and management of the components and transmission of optical networks. Filled with examples, figures, and problem sets to aid in development of dependable, speedy networks. Focuses on practical, networking-specific issues: everything you need to know to implement currently available optical solutions.

The essential guide to the state of the art

in WDM and its vast networking potential. As a result of its huge transmission capacity and countless other advantages, fiber optics has fostered a bandwidth revolution, addressing the constantly growing demand for increased bandwidth. Within this burgeoning area, Wavelength Division Multiplexing (WDM) has emerged as a breakthrough technology for exploiting the capacity of optical fibers. Today, WDM is deployed by many network providers for point-to-point transmission-but there is strong momentum to develop it as a full-fledged networking technology in its own right. The telecommunications industry, network service providers, and research communities worldwide are paying close attention. Optical WDM Networks presents an easy-to-follow introduction to basic concepts, key issues, effective solutions, and state-of-the-art technologies for wavelength-routed WDM networks. Responding to the need for resources focused on the networking potential of WDM, the book is organized in terms of the most important networking aspects, such as: * Network control architecture * Routing and wavelength assignment * Virtual topology design and reconfiguration * Distributed lightpath con-

trol and management * Optical-layer protection and restoration * IP over WDM * Trends for the future in optical networks Each chapter includes examples and problems that illustrate and offer practical application of concepts, as well as extensive references for further reading. This is an essential resource for professionals and students in electrical engineering, computer engineering, and computer science as well as network engineers, designers, planners, operators, and managers who seek a backbone of knowledge in optical networks.

This helpful guide provides practicing engineers, students, and researchers with a systematic, up-to-date introduction to the fundamental concepts, challenges, and state-of-the-art developments in WDM optical networks. The authors rely extensively on real-world examples and draw on the latest research to cover optical network design and provisioning in far greater depth than any other book.

Intended as a graduate/post graduate level textbook for courses on high speed optical networks as well as computer networks. The ten chapters cover basic princi-

ples of the technology as well as latest developments, and further discusses network security, survivability and reliability of optical networks and priority schemes used in wavelength routing. The book also goes on to examine FTTH standards, deployments and research issues and includes examples throughout all the chapters aid understanding of problems and solutions.

This book constitutes the refereed proceedings of the 9th Asia-Pacific Network Operations and Management Symposium, AP-NOMS 2007, held in Sapporo, Japan, October 2007. The 48 revised full papers and 30 revised short papers cover management of distributed networks, network configuration and planning, network security management, sensor and ad-hoc networks, network monitoring, routing and traffic engineering, management of wireless networks and security on wireless networks.

The Internet revolution. Once, the public was delighted with 14.4 modem access and fascinated by low-tech Web site content. But not for long. Technology has raced to keep up with users' calls for high-speed facilities and advanced applications. With the development of high-speed

transmission media and the availability of high-speed hardware, we are fast approaching the day when a single communication network will support all communication activities-and that network will use optical fibers as its transmission media and optical switch/routers as its nodes. The Handbook of Optical Communication Networks presents comprehensive, up-to-date technical information on integrated, state-of-the-art optical networks. Beginning with an in-depth introduction to the field, top international authorities explore every major aspect of optical networks, from basic concepts to research grade material. Their discussions cover all of the essential topics, including protocols, resource management, routing and wavelength assignment in WDM networks, connection management, survivability, enabling technologies, and future trends. To meet the remaining technical and implementation challenges of optical networks, present and future communications professionals need a convenient, one-stop source for the relevant fundamentals, technical details, and applications. The Handbook of Optical Communication Networks provides that information in a presentation that is structured for

fast access, organized for optimum utility, and packed with the insights of true leaders in the field.

This book presents fundamental passive optical network (PON) concepts, providing you with the tools needed to understand, design, and build these new access networks. The logical sequence of topics begins with the underlying principles and components of optical fiber communication technologies used in access networks. Next, the book progresses from descriptions of PON and fiber-to-the-X (FTTX) alternatives to their application to fiber-to-the-premises (FTTP) networks and, lastly, to essential measurement and testing procedures for network installation and maintenance. An Instructor's Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department.

This book is intended as an undergraduate/postgraduate level textbook for courses on high-speed optical networks as well as computer networks. Nine chapters cover the basic principles of the technology and different devices for optical networks, as well as processing of integrated

waveguide devices of optical networks using different technologies. It provides students, researchers and practicing engineers with an expert guide to the fundamental concepts, issues and state-of-the-art developments in optical networks. It includes examples throughout all the chapters of the book to aid understanding of basic problems and solutions. Presents basics of the optical network devices and discusses latest developments. Includes examples and exercises throughout all the chapters of the book to aid understanding of basic problems and solutions for undergraduate and postgraduate students. Discusses different optical network node architectures and their components. Includes basic theories and latest developments of hardware devices with their fabrication technologies (such as optical switch, wavelength router, wavelength division multiplexer/demultiplexer and add/drop multiplexer), helpful for researchers to initiate research on this field and to develop research problem-solving capability. Reviews fiber-optic networks without WDM and single-hop and multi-hop WDM optical networks. P. P. Sahu received his M.Tech. degree from the Indian Institute of Technolo-

gy Delhi and his Ph.D. degree in engineering from Jadavpur University, India. In 1991, he joined Haryana State Electronics Development Corporation Limited, where he has been engaged in R&D works related to optical fiber components and telecommunication instruments. In 1996, he joined Northeastern Regional Institute of Science and Technology as a faculty member. At present, he is working as a professor in the Department of Electronics and Communication Engineering, Tezpur Central University, India. His field of interest is integrated optic and electronic circuits, wireless and optical communication, clinical instrumentation, green energy, etc. He has received an INSA teacher award (instituted by the highest academic body Indian National Science Academy) for high level of teaching and research. He has published more than 90 papers in peer-reviewed international journals, 60 papers in international conference, and has written five books published by Springer Nature, McGraw-Hill. Dr Sahu is a Fellow of the Optical Society of India, Life Member of Indian Society for Technical Education and Senior Member of the IEEE.

This book provides a comprehensive de-

scription of an optical communications technology known as free space optical—a next-generation communications network that uses optical signals through the atmosphere instead of fiber, RF, or microwaves. This technology potentially offers more complex ultrabandwidth communication services simultaneously to multiple users and in a very short time, compared to fiber optic technology. This text presents established and new advancements drawn from the latest research and development in components, networking, operation, and practices. This book describes the FSO network concepts in simple language. It provides comprehensive coverage in an easy-to-understand, progressive style that starts from the physics of the atmosphere and how it affects optical communications; continues with the design of a network node; and concludes with fiberless network applications from point-to-point to mesh topology. Important areas discussed include: Propagation of light in the atmosphere and phenomena that affect light propagation FSO transceiver design Point-to-point FSO systems Ring FSO systems Mesh-FSO systems and integrating the Mesh-FSO with the public network WDM

Mesh-FSO FSO network security FSO-specific applications To meet the needs of both academia and industry, key mathematical formulas are presented along with descriptions, while extensive mathematical analyses are minimized or avoided. Free Space Optical Networks for Ultra-Broad Band Services serves as an ideal text for network communication professionals who enter the free space optical communication field, graduate students majoring in optical communications, optical communication engineers, researchers, managers, and consultants.

This two-volume set, CCIS 0269-CCIS 0270, constitutes the refereed post-conference proceedings of the International Conference on Global Trends in Computing and Communication, ObCom 2011, held in Vellore, India, in December 2011. The 173 full papers presented together with a keynote paper and invited papers were carefully reviewed and selected from 842 submissions. The conference addresses all current issues associated with computing, communication and information. The proceedings consists of invited papers dealing with the review of performance models of computer and communication systems

and contributed papers that feature topics such as networking, cloud computing, fuzzy logic, mobile communication, image processing, navigation systems, biometrics and Web services covering literally all the vital areas of the computing domains.

The Internet revolution. Once, the public was delighted with 14.4 modem access and fascinated by low-tech Web site content. But not for long. Technology has raced to keep up with users' calls for high-speed facilities and advanced applications. With the development of high-speed transmission media and the availability of high-speed hardware, we are

Provides a comprehensive and updated account of WDM optical network systems Optical networking has advanced considerably since 2010. A host of new technologies and applications has brought a significant change in optical networks, migrating it towards an all-optical network. This book places great emphasis on the network concepts, technology, and methodologies that will stand the test of time and also help in understanding and developing advanced optical network systems. The first part of Optical WDM Networks: From Static to Elas-

tic Networks provides a qualitative foundation for what follows—presenting an overview of optical networking, the different network architectures, basic concepts, and a high-level view of the different network structures considered in subsequent chapters. It offers a survey of enabling technologies and the hardware devices in the physical layer, followed by a more detailed picture of the network in the remaining chapters. The next sections give an in-depth study of the three basic network structures: the static broadcast networks, wavelength routed networks, and the electronic/optical logically routed networks, covering the characteristics of the optical networks in the access, metropolitan area, and long-haul reach. It discusses the networking picture; network control and management, impairment management and survivability. The last section of the book covers the upcoming technologies of flex-grid and software defined optical networking. Provides concise, updated, and comprehensive coverage of WDM optical networks. Features numerous examples and exercise problems for the student to practice. Covers, in detail, important topics, such as, access, local area, metropolitan,

wide area all-optical and elastic networks. Includes protocols, design, and analysis along with the control and management of the networks. Offers exclusive chapters on advance topics to cover the present and future technological trends, such as, software defined optical networking and the flexible grid optical networks. Optical WDM Networks: From Static to Elastic Networks is an excellent book for under and post graduate students in electrical/communication engineering. It will also be very useful to practicing professionals in communications, networking, and optical systems. Multiwavelength Optical Networks systematically studies the major research issues in WDM (Wavelength Division Multiplexing) optical networks, such as routing and wavelength assignment, QoS multicast routing, design of logical topologies, and placement of wavelength converters. The book consists of two parts. The first part studies the fundamental concepts and principles of WDM networks. The second part discusses advanced and research issues of WDM networks. The authors of the book have many years of working experience in the areas of computer networks and network optimization. The book discusses

many difficult issues of WDM networks in a very comprehensive way. For each problem, there is a background discussion, and then the mathematical formulation, followed by the solutions.

This book is intended as a graduate/post graduate level textbook for courses on high-speed optical networks as well as computer networks. The ten chapters cover basic principles of the technology as well as latest developments and further discuss network security, survivability, and reliability of optical networks and priority schemes used in wavelength routing. This book also goes on to examine Fiber To The Home (FTTH) standards and their deployment and research issues and includes examples in all the chapters to aid the understanding of problems and solutions. Presents advanced concepts of optical network devices. Includes examples and exercises in all the chapters of the book to aid the understanding of basic problems and solutions for undergraduate and postgraduate students. Discusses optical ring metropolitan area networks and queuing system and its interconnection with other networks. Discusses routing and wavelength assignment. Examines restoration

schemes in the survivability of optical networks

Provides a comprehensive and updated account of WDM optical network systems. Optical networking has advanced considerably since 2010. A host of new technologies and applications has brought a significant change in optical networks, migrating it towards an all-optical network. This book places great emphasis on the network concepts, technology, and methodologies that will stand the test of time and also help in understanding and developing advanced optical network systems. The first part of *Optical WDM Networks: From Static to Elastic Networks* provides a qualitative foundation for what follows--presenting an overview of optical networking, the different network architectures, basic concepts, and a high-level view of the different network structures considered in subsequent chapters. It offers a survey of enabling technologies and the hardware devices in the physical layer, followed by a more detailed picture of the network in the remaining chapters. The next sections give an in-depth study of the three basic network structures: the static broadcast networks,

wavelength routed networks, and the electronic/optical logically routed networks, covering the characteristics of the optical networks in the access, metropolitan area, and long-haul reach. It discusses the networking picture; network control and management, impairment management and survivability. The last section of the book covers the upcoming technologies of flex-grid and software defined optical networking. Provides concise, updated, and comprehensive coverage of WDM optical networks. Features numerous examples and exercise problems for the student to practice. Covers, in detail, important topics, such as, access, local area, metropolitan, wide area all-optical and elastic networks. Includes protocols, design, and analysis along with the control and management of the networks. Offers exclusive chapters on advance topics to cover the present and future technological trends, such as, software defined optical networking and the flexible grid optical networks. *Optical WDM Networks: From Static to Elastic Networks* is an excellent book for under and post graduate students in electrical/communication engineering. It will also be very useful to practicing professionals in communica-

tions, networking, and optical systems. During the last thirty years or so it has been widely recognised in the research community that the key transmission medium seeming capable of serving both the ever-growing demand for bandwidth and the unceasing need for new services, is optical fibre. In this context, Wavelength Division Multiplexing (WDM) is the most popular technique for introducing concurrency among multiple user transmissions into the network and, thus, exploiting the huge amount of fibre bandwidth available under the severe limitations imposed by electronics speed on the maximum network access rate. This book extensively covers an important research area in optical networking, enabling readers to fully understand the concepts of optical LANs and learn details of architecture issues and control protocols. Through its careful focus on the local area, the book, covers the major architectural, topological and protocol issues regarding optical Local Area Networks (LANs) today. Considering that constant advances on optical component technology make all-optical WDM LANs all the more feasible for a wide commercial deployment, the book investigates thoroughly

the crucial latter topic, i.e. the Media-Access Control (MAC) protocols that should be used. Besides introducing a noteworthy part of the vast literature on such protocols and providing some helpful distinguishing key protocol characteristics, the book is also innovative in focusing on a recent significant class of promising protocols whose operation is based on network feedback information. In this way, these adaptive protocols for optical LANs achieve an overall higher performance in comparison with many other non-adaptive schemes. Multiwavelength Optical LANs: Enables readers to understand the concepts of optical LANs and learn details of architecture issues and control protocols Focuses on the major architectural, topological and protocol issues regarding optical local area networks Presents the important class of adaptive protocols for optical LANs No Optical systems/network developers, or engineers and scientists working in optical networking should be without this book. The well considered approach also makes this recommended reading for undergraduate and graduate computer science, computer, electrical and telecommunications engineering students.

Time division multiplexing (TDM) has been the fundamental basis for adding capacity to digital telecommunications networks for decades. However, within the past two years, wavelength division multiplexing (WDM) has been emerging as an important and widely deployed complement to TDM. Sales of systems based on the new technology have risen at breathtaking speed. The driving force behind this sales explosion was the unexpected rapid exhaustion of long distance fiber network capacity. This fiber exhaust, combined with favorable economics for WDM, led to the use of this technology over other alternatives. The WDM deployment raises fundamental and challenging problems that require novel and innovative solutions. This volume presents papers from an interdisciplinary workshop held at DIMACS on multichannel optical networks. Leading computer science theorists and practitioners discussed admissions control, routing and channel assignment, multicasting and protection, and fault-tolerance. The book features application of theoretical and/or algorithmic results to practical problems and addresses the influence of practical problems to theoretical/algorithmic

studies. The volume can serve as a text for an advanced course in computer science, networking, and operations research.

This book provides a broad overview of IP over WDM technologies, as seen by a group of experts participating in the e-Photon/ONeC and BONE Networks of Excellence funded within the VIth and VIIth Research Framework Programmes (FP6 and FP7) of the European Union. Both Networks of Excellence are aimed at the integration of research teams active on optical networks at a pan-European level, with the creation of virtual centers of excellence in optical networks, technologies, and services. The working groups on optical core networks gathered about a 100 researchers from more than 20 universities and research institutions in Europe. The multifaceted viewpoints available in this community on the current state and future evolution of large WDM networking infrastructures are reported in this book. The book is organized in chapters, with chapter editors, listed on pp-, having the responsibility to collect and harmonize contributions by different - search groups. The whole work was made possible by the coordina-

tion efforts of Javier Aracil and Franco Callegati, leaders, at the time when the book writing was begun, of the working groups on optical core networks and on optical burst switching in e-Photon/ONeC. We are thankful to them for their efforts. We hope that this manuscript will serve as a valuable reference for students and practitioners in the field of optical networking.

This book presents an in-depth treatment of routing and wavelength assignment for optical networks, and focuses specifically on quality-of-service and fault resiliency issues. It reports on novel approaches for the development of routing and wavelength assignment schemes for fault-resilient optical networks, which improve their performance in terms of signal quality, call blocking, congestion level and reliability, without a substantial increase in network setup cost. The book first presents a solution for reducing the effect of the wavelength continuity constraint during the routing and wavelength assignment phase. Further, it reports on an approach allowing the incorporation of a traffic grooming mechanism with routing and wavelength assignment to enhance the

effective channel utilization of a given capacity optical network using fewer electrical-optical-electrical conversions. As a third step, it addresses a quality of service provision scheme for wavelength-division multiplexing (WDM)-based optical networks. Lastly, the book describes the inclusion of a tree-based fault resilience scheme in priority-based dispersion-reduced wavelength assignment schemes for the purpose of improving network reliability, while maintaining a better utilization of network resources. Mainly intended for graduate students and researchers, the book provides them with extensive information on both fundamental and advanced technologies for routing and wavelength assignment in optical networks. The topics covered will also be of interest to network planners and designers.

As the increased demand for high-speed communication creates an interest in the development of optical networks, intelligent all optical networks have emerged as the next generation for reliable and fast connections. Intelligent Systems for Optical Networks Design: Advancing Techniques is a comprehensive collection of research focused on theoretical and practi-

cal aspects of intelligent methodologies as applied to real world problems. This reference source is useful for research and development engineers, scholars, and students interested in the latest development in the area of intelligent systems for optical networks design.

With the advent of wavelength routing and dynamic, reconfigurable optical networks, new demands are being made in the design and operation of optical amplifiers. This book provides, for the first time, a comprehensive review of optical amplifier technology in the context of these recent advances in the field. It demonstrates how to manage the trade-offs between amplifier design, network architecture and system management and operation. The book provides an overview of optical amplifiers and reconfigurable networks before examining in greater detail the issues of importance to network operators and equipment manufacturers, including 40G and 100G transmission. Optical amplifier design is fully considered, focusing on fundamentals, design solutions and amplifier performance limitations. Finally, the book discusses other emerging applications for optical amplifiers such as optical networks

for high data rate systems, free space systems, long single span links and optical digital networks. This book will be of great value to R&D engineers, network and systems engineers, telecommunications service providers, component suppliers, industry analysts, network operators, postgraduate students, academics and anyone seeking to understand emerging trends in optical networks and the consequent changes in optical amplifier design, features and applications. Provides an in depth and focused review of the new reconfigurable network architecture and its impact on optical amplifiers Addresses 40G and 100G transmission and networking Written by experts in the field with deep technical knowledge and practical experience of commercial practice and concerns

Providing straightforward practical guidance, this highly accessible resource presents today's most advanced topics on photonic communications. You get the latest details on 5th generation photonic systems that can be readily applied to your projects in the field. Moreover, the book provides valuable, time-saving tools for network simulation and modeling. You find in-depth coverage of optical signal trans-

mission systems and networks. The book includes coverage of a wide range of critical methods and techniques, such as MI-MO (multiple-input and multiple-output), OFDM (Orthogonal frequency-division multiplexing), and advanced modulation and coding. You find detailed discussions on the basic principles and applications of high-speed digital signal processing. Other key topics include advanced concepts on coded-modulation, turbo equalization, polarization-time coding, spatial-domain-based modulation and coding, and multidimensional signaling. This comprehensive book includes a complete set of problems at the end of each chapter to help you master the material.

"This book presents a comprehensive overview of emerging optical access network solutions to efficiently meet the anticipated growth in bandwidth demand"--Provided by publisher.

This LNCS volume contains the papers presented at the First Swarm, Evolutionary and Memetic Computing Conference (SEMCCO 2010) held during December 16-- 18, 2010 at SRM University, Chennai, in India. SEMCCO 2010 marked the beginning of a

prestigious international conference series that aims at bringing together researchers from academia and industry to report and review the latest progress in the cutting-edge research on swarm, evolutionary, and memetic computing, to explore new application areas, to design new bio-inspired algorithms for solving specific hard optimization problems, and finally to create awareness on these domains to a wider audience of practitioners. SEMCCO 2010 received 225 paper submissions from 20 countries across the globe. After a rigorous peer-review process involving 610 reviews in total, 90 full-length articles were accepted for oral presentation at the conference. This corresponds to an acceptance rate of 40% and is intended for maintaining the high standards of the conference proceedings. The papers included in this LNCS volume cover a wide range of topics in swarm, evolutionary, and memetic computing algorithms and their real-world applications in problems selected from diverse domains of science and engineering.

The five-volume set LNCS 3980-3984 constitutes the refereed proceedings of the International Conference on Computational

Science and Its Applications, ICCSA 2006. The volumes present a total of 664 papers organized according to the five major conference themes: computational methods, algorithms and applications high performance technical computing and networks advanced and emerging applications geometric modelling, graphics and visualization information systems and information technologies. This is Part II.

This book presents the proceedings of the 3rd International Conference of Reliable Information and Communication Technology 2018 (IRICT 2018), which was held in Kuala Lumpur, Malaysia, on July 23–24, 2018. The main theme of the conference was “Data Science, AI and IoT Trends for the Fourth Industrial Revolution.” A total of 158 papers were submitted to the conference, of which 103 were accepted and considered for publication in this book. Several hot research topics are covered, including Advances in Data Science and Big Data Analytics, Artificial Intelligence and Soft Computing, Business Intelligence, Internet of Things (IoT) Technologies and Applications, Intelligent Communication Systems, Advances in Computer Vision, Health Informatics, Reliable Cloud Computing Environ-

ments, Recent Trends in Knowledge Management, Security Issues in the Cyber World, and Advances in Information Systems Research, Theories and Methods.

Optical Networking Best Practices Handbook presents optical networking in a very comprehensive way for nonengineers needing to understand the fundamentals of fiber, high-capacity, high-speed equipment and networks, and upcoming carrier services. The book provides a practical understanding of fiber optics as a physical medium, sorting out single-mode versus multi-mode and the crucial concept of Dense Wave-Division Multiplexing.

This book offers a broad overview of techniques used in the design of Wavelength Division Multiplexing (WDM) networks for efficient dissemination of information in computer networks. It starts with an overview of the hardware components then provides a thorough review of WDM. Each topic is covered rigorously with emphasis on detailed explanations of the approaches used. Numerous exercises are included.

bull; Master advanced optical network design and management strategies bull;

Learn from real-world case-studies that feature the Cisco Systems ONS product line bull; A must-have reference for any IT professional involved in Optical networks

Optical WDM networking technology is spearheading a bandwidth revolution in the networking infrastructure being developed for the next generation Internet. Rapid advances in optical components have enabled the transition from point-to-point WDM links to all-optical networking. Optical WDM Networks: Principles and Practice presents some of the most important challenges facing the optical networking community, along with some suggested solutions. Earlier textbooks in optical networking have a narrower perspective, and rapidly advancing research has created the need for fresh and current information on problems and issues in the field. The volume editors and contributing authors have endeavoured to capture a substantial subset of the key problems and known solutions to these problems. All of the chapters are original contributions from leading international researchers. The chapters address a wide variety of topics, including the state of the art in WDM technology, physical components that make up

WDM fiber-optic networks, medium access protocols, wavelength routed networks, optical access networks, network management, and performance evaluation of wavelength routing networks. The

chapters also survey critical points in past research and tackle more recent problems. Practitioners and network product engineers interested in current state-

of-the-art information beyond textbook-type coverage, and graduate students commencing research in this area, will appreciate the concise - and pertinent - information presented herein.