Contents

Part I Overview and System Technologies

1 Social Demand of New Generation Information Network: Introduction to High Spectral Density Optical Communication Technology 3
Takeshi Kamiya, Tetsuya Miyazaki, and Fumito Kubota

2 Coherent Optical Communications: Historical Perspectives and Future Directions 11
Kazuro Kikuchi

3 Ultrahigh Spectral Density Coherent Optical Transmission Technologies 51
Masataka Nakazawa

4 "Quasi Ultimate" Technique 81
Tetsuya Miyazaki

5 High-Speed and High-Capacity Optical Transmission Systems 103
Peter J. Winzer and Rene-Jean Essiambre

Part II Advanced Modulation Formats

6 Multilevel Signaling with Direct Detection 131
Nobuhiko Kikuchi

7 High Spectral Efficiency Coherent Optical OFDM 141
William Shieh and Xingwen Yi

8 Polarization Division-Multiplexed Coherent Optical OFDM Transmission Enabled by MIMO Processing 167
Sander L. Jansen and Itsuro Morita

9 No-Guard-Interval Coherent Optical OFDM with Frequency Domain Equalization 179
Yutaka Miyamoto and Yasuyuki Takatori

10 QPSK-Based Transmission System: Trade-Offs Between Linear and Nonlinear Impairments 191
Takeshi Hoshida and Jens C. Rasmussen

11 Real-Time Digital Coherent QPSK Transmission Technologies 203
Timo Pfau and Reinhold Noé

12 Challenge for Full Control of Polarization in Optical Communication Systems 215
Shiro Ryu

Part III Opto-electronics Devices

13 Semiconductor Lasers for High-Density Optical Communication Systems 229
Hiroyuki Uenohara

14 Monolithic InP Photonic Integrated Circuits for Transmitting or Receiving Information with Augmented Fidelity or Spectral Efficiency 251
C.R. Doerr

15 Integrated Mach–Zehnder Interferometer-Based Modulators for Advanced Modulation Formats 273
Tetsuya Kawanishi

16 Key Devices for High-Speed Optical Communication and Their Application to Transceiver Module 287
Hiroyuki Matsuura

17 Forward Error Correction 303
Takashi Mizuochi

Index 335