Nome da Disciplina: Especificação Formal e Validação de Protocolos de Comunicação
Nível: Graduação e Pós-Graduação
Créditos: 4
Obrigatória: ( ) Sim (x) Não

Docente(s) Responsável/(is):
Rossana Maria de Castro Andrade

Ementa:
Princípios de especificação e validação de protocolos. Técnicas de especificação e validação semi-formais e formais. Use Case Maps. LOTOS básico. Diagrama de Estados. Diagramas de Seqüência (MSCs). SDL. Redes de Petri. Verificação de Software. Técnicas e estratégias de geração de testes. Reuso de Sistemas. Conceitos de Estilos de Especificação e Validação.

Bibliografia Recomendada

[1] Bolognesi, T., and Brinksma, E., "Introduction to the ISO Specification Language LOTOS," *Protocol Specification, Testing and Validation VIII*, North-Holland, 23-73, 1988.

[2] Buhr, R. J. A. "Use Case Maps as Architectural Entities for Complex Systems". In: IEEE Transactions on Software Engineering, Special Issue on Scenario Management. Vol. 24, No. 12, December 1998. Available at http://www.UseCaseMaps.org/UseCaseMaps/pub/tse98final.pdf

[3] Amyot, D., *Specification and Validation of Telecommunication Systems with Use Case Maps and LOTOS*, Ph.D Thesis in Computer Science, Ottawa-Carleton Institute for Computer Science, submitted in January 2001.

[4] Amyot, D. and Logrippo, L., "Use Case Maps and LOTOS for the Prototyping and Validation of a Mobile Group Call System," *Computer Communications 23*, Special Issue on FDTS, 1135-1157, 2000.

[5] Amyot, D., and Mussbacher, G., "On the Extension of UML with Use Case Maps Concepts," In: *3rd International Conference on the Unified Modeling Language (UML2000)*, LNCS 1939, 16-31, York, UK, October 2000. Available at www.usecasemaps.org/pub/cc99.pdf

[6] Amyot, D., Andrade, R., "Description of Wireless Intelligent Networks with Use Case Maps", *Proc. Brazilian Symposium on Computer Networks (SBRC'99)*, Salvador (BA), Brazil, 418-433, May 25-28, 1999.

[7] Amyot, D., Andrade, R., Logrippo, L., Sincennes, J., and Yi, Z. (1999) "Formal Methods for Mobility Standards". *IEEE 1999 Emerging Technology Symposium on Wireless Communications & Systems*, Dallas, USA, April 12-13, 1999.

[8] Amyot, D., Hart, N., Logrippo, L., and Forhan, P., "Formal Specification and Validation using a Scenario-Based Approach: The GPRS Group-Call Example," In: *ObjecTime Workshop on Research in OO Real-Time Modeling*, Ottawa, Canada, January 1998. Available at http://www.csi.uottawa.ca/~damyot/wrroom98/wrroom98.pdf

[9] Andrade, R., and Logrippo, L., "Reusability at the Early Development Stages of the Mobile Wireless Communication Systems," In: *Proceedings of the 4th World Multiconference on Systemics, Cybernetics and Informatics (SCI 2000)*, Vol. VII, Computer Science and Engineering: Part I, Orlando, Florida, pp. 11-16, July 2000.

[10] Andrade, R., "Applying Use Case Maps and Formal Methods to the Development of Wireless Mobile ATM Networks", In: *Proc. of the Fifth NASA Langley Formal Methods Workshop*, Williamsburg, Virginia, June 2000.

[11] Logrippo. L., Faci, M., Haj-Hussein, M., "An Introduction to LOTOS: Learning by Examples," *Computer Network and ISDN Systems 23*, 325-342, 1992.

[12] Pressman, Roger S., *Engenharia de Software*, Makron Books, 1995. ISBN 85-346-0237-9.
[13] Pressman, Roger S., *Software Engineering: a practitioner's approach*, Fifth Edition, McGraw-Hill Series in Computer Science, 2001. ISBN 0-07-365578-3.
[14] Sommerville, Ian, *Software Engineering*, 6th Edition, Addison-Wesley Publishers Ltd., 2001. ISBN 0-201-39815-X.
[15] *Use Case Maps Web Page and UCM User Grou*p: http://www.UseCaseMaps.org, since 1999.
[16] Use Case Maps Tutorial. Available at Use Case Maps User Group http://www.UseCaseMaps.org

Bibliografia Geral:

[17] Abramski, S., Gabbay, D.V., and Maibaum, T.S.E. Handbook of Logic in Computer Science. Oxford Science Publications, 1992.
[18] Baeten, J.C.M. Process algebra. Cambridge University Press, 1990.
[19] Barringer, H. A Survey of Verification Techniques for Parallel Programs. Lecture Notes in Computer Science, No. 191. Springer, 1985.
[20] Bergstra, J.A., Heering, J. and Klint, P. Algebraic Specification. 1989.
[21] Berztiss, A.T., and Thatte, S. Specification and Implementation of Abstract Data Types. In: Advances in Computers, Vol 22 (Ed. M.C. Yovits), Academic Press, New York, 1983.
[22] Bolognesi, T., van de Lagemaat, J., and Vissers, C. LOTOSphere: Software Development with LOTOS. Kluwer Academic Publishers, 1995.
[23] Bruns, G. Distributed Systems Analysis with CCS. Prentice-Hall, 1997.
[24] Comer, Douglas E., *Computer Networks and Internets*, 2nd Edition, Prentice-Hall, Inc., 1999. ISBN 0-13-083617-6.
[25] Danthine, A. The OSI95 Transport Service with Multimedia Support. Springer, 1994.
[26] Dornan, Andy, Wireless Communication: o guia essencial de comunicação sem fio, Ed. Campus, 2000. ISBN 85-352-0765-1.
[27] Ehrig, H., and Mahr, B. Fundamentals of Algebraic Specification 1. Springer-Verlag 1985.
[28] Fokkink, W. Introduction to Process Algebra. Springer, 1999.
[29] Goguen, J. and Malcom, G. Algebraic Semantics of Imperative Programs. MIT Press, 1996.
[30] Guttag, J.V., Horowitz, E., and Musser, D. The Design of Data Type Specifications. Current Trends in Programming Methodology. ed. R. Yeh, Vol.IV, Prentice-Hall,1978.
[31] Hailpern, Brent T. Verifying Concurrent Processes Using Temporal Logic. Lecture Notes in Computer Science No. 129
[32] Hailpern, B.T., and Owicki, S.S. Modular Verification of Computer Communication Protocols. IEEE Trans. on Comm. Vol. COM-31 (Jan. 1983) 56-68.
[33] Hennessy, M. Algebraic Theory of Processes. Cambridge, 1988.
[34] Hennessy, M. The Semantics of Programming Languages. Wiley, 1990.
[35] Hinchey, M.G. and Jarvis, S.A. Concurrent Systems: Formal Development in CSP. McGraw-Hill, 1995.
[36] Hoare, C.A.R. Communicating Sequential Processes. Prentice-Hall, 1986.
[37] Kroger, F. Temporal Logic of Programs. Springer-Verlag, 1987.
[38] Liskov, B., and Zilles, S. An Introduction to Formal Specification of Data Abstractions. In: R. Yeh (ed.) Current Trends in Programming Methodology, Vol. 1, 1-32.
[39] Manna, Z. and Pnueli, A. The Temporal Logic of Reactive and Concurrent Systems. Springer-Verlag, vol. 1 and 2, 1992 and 1995.
[40] Meseguer, J., and Goguen, J.A. Initiality, Induction, and Computability. In: M.Nivat and J.C.Reynolds (eds.) Algebraic Methods in Semantics. Cambridge University Press, 1985, 459-541.
[41] Milner, R. A Calculus of Communicating Systems. Lecture Notes in Computer Science, No. 92. Springer-Verlag 1980.
[42] Milner, R. Communication and Concurrency. Prentice-Hall, 1989.

[43] Milner, R. Elements of Interaction (Turing Award Lecture). Comm. ACM, Vol. 36, No 1, 78-89.
[44] Murhammer, Martin W., et al., *TCP/IP Tutorial e Técnico*, Makron Books, 2000. ISBN 85-346-1188-2.
[45] Roscoe, A.W. The Theory and Practice of Concurrency. Prentice-Hall, 1998
[46] Sarikaya, B. Principles of protocol engineering and conformance testing. Ellis Horwood, 1993.
[47] Soares, Luís Fernando, et al, *Das LANs, MANs, WANs às Redes ATM*, Editora Campus, 2a Edição, 1995. ISBN 85-7001-954-8.
[48] Tanenbaum, Andrew S., *Redes de Computadores*, Editora Campus, Terceira Edição Americana, 1996.
[49] Turner, K.J. (Ed.)Using Formal Description Techniques. An Introduction to Estelle, LOTOS and SDL. Wiley, 1993.
[50] van Eijk, P.H.J., Vissers, C.A., Diaz, M. (eds.) The Formal Description Technique LOTOS. North-Holland, 1989.
[51] van Leeuwen, J. (ed.) Handbook of Theoretical Computer Science. Volume B: Formal Models and Semantics. MIT Press/Elsevier, 1990.

Carga de Trabalho e Provas

1. Prova no meio do período (10 pontos)
2. Prova no final do período (10 pontos)
3. 4 Listas de Exercícios em classe – aula prática (1 ponto cada)
4. Projeto – Especificação Semi-Formal e Formal (10 pontos): trabalho em grupo de 2 ou 3 pessoas – escolha um protocolo, uma aplicação ou um sistema e especifique utilizando pelo menos duas notações, sendo uma delas sendo necessariamente formal.
5. Apresentação do trabalho (6 pontos): trabalho individual – faça uma apresentação na classe de 15 minutos com mais 5 para perguntas sobre o projeto.