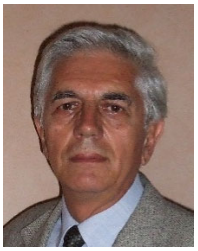
KEMAL HANJALIĆ



Dipl. ing. (Mašinski fakultet, Univerzitet u Sarajevu, 1964)

M. Sc. (University of Birmingham, UK, 1966)

Ph. D. (Imperial College, University of London, UK, 1970

https://www.anubih.ba/kemal-hanjalic/

https://scholar.google.com/citations?user=cNkD2u8AAAAJ&hl=en

https://www.scopus.com/authid/detail.uri?authorId=57218887242

https://www.webofscience.com/wos/author/record/3814164

Akademik Kemal Hanjalić, Emeritus profesor Univerziteta u Sarajevu i Tehničkog univerziteta Delft, Nizozemska, rođen je 30.11.1939 g. u Sarajevu gdje je završio osnovnu školu, gimnaziju i Mašinski fakultet. Nakon diplomiranja radi kao stručni saradnik u Istraživačko-razvojnom centru (kasnije Institut) za termotehniku i nuklearnu tehniku ITEN-Energoinvest (1964-80). Istovremeno je izabran za asistenta na Mašinskom fakultetu gdje je kasnije biran u zvanje predavača (1968), docenta (1971), vanrednog (1975) i redovnog profesora (1979) na predmetima Mehanika fluida i Toplotne turbomašine. 1980 g. prelazi na Mašinski fakultet u stalni radni odnos uz dopunski angažman kao naučni saradnik ITEN-a.

U julu 1991. odlazi po pozivu na Friedrich Alexander Univerzitet Erlangen-Nürnberg kao gostujući profesor Njemačke naučne fondacije DFG. Od 1993. je redovni profesor na Tehnološkom univerzitetu Michigan, Houghton, SAD, a od 1994. profesor i voditelj Katedre za termo-fluidne nauke Tehničkog univerziteta Delft, Nizozemska. Nakon emeritiranja 31.3.2005 do 2006 je DAAD gostujući profesor na Tehničkom univerzitetu Darmstadt, Njemačka. Od 2007 do 2011. je profesor i titular EU katedre Marie Curie na Dept. za mehaniku i aeronautiku Sapienza Univerziteta u Rimu. Kao dobitnik Lead Scientist Grant Ruske Federacije, od 2011 do 2016 vodi Laboratorij za simulacije energetskih procesa na Državnom univerzitetu i Institutu za termofiziku Ruske Aldemije Nauka u Novosibirsku.

Naučna i stručna djelatnost K. Hanjalića obuhvata fundamentalna i primijenjena istraživanja u oblasti termo-fluidnih nauka (mehanika fluida, termotehnika, prenos toplote i mase, sagorijevanje, magneto-hidrodinamika). Spada među najcitiranije naučnike u BiH, uvršten u Elsevier listu 2% najuticajnijih autora, sa međunarodnom reputacijom jednog od pionira i vodećeg naučnog autoriteta u oblasti matematskog modeliranja i numeričkih simulacija turbulencije i transportnih procesa i njihove primjene u raznim oblastima inženjerstva i okoliša.

Radio je i na istraživanju i razvoju novih uređaja i procesa u termotehnici i termoenergetici, posebno klipnih i zavojnih kompresora (sa N. Stošićem, realizirani u tvornici Trudbenik, Energoinvest), novog metoda kontinuirane gasifikacije uglja, pulzirajućih gorionika, primjene detonacionih talasa za pogonsko otklanjanje naslaga (šljaka, pepeo) u kotlovima na ugalj (dva patenta sa I. Smajevićem) realizirani i u pogonu (1989-2011) na dva kotla u termoelektrani Kakanj.

Obavljao je više stručnih i društvenih funkcija: direktor Instituta za procesnu tehniku, energetiku i tehniku sredine IPES (1980-1984), prodekan (1975-78) i dekan (1984-85) Mašinskog fakulteta u Sarajevu, te gradonačelnik Sarajeva (1985-87). Bio je član Izvršnog vijeća Bosne i Hercegovine (1987-91) kada je pokrenuo i vodio izradu prve Strategije

naučno-tehnološkog razvoja BiH usvojene na Skupštini SR BiH 1990, te projekat modernizacije i revitalizacije istraživačke i pedagoške opreme na svim univerzitetima u BiH. Bio je delegat SFR Jugoslavije u Komitetu za životnu sredinu OECD-a u Parizu (1982-1990), predsjednik Savjeta zajednica za naučni rad SFR Jugoslavije (1987-88), te predsjednik Zajednice gradova i opština SFR Jugoslavije (1985-86).

Predavao je i konsultirao na brojnim univerzitetima i institutima u BiH (Banja Luka, Zenica), SFR Jugoslaviji (Novi Sad, Podgorica, Zagreb) i inostranstvu: London - Imperial College (1972-74, 2001-02), Univ. Califonia Davis (1978-80), Von Karman Inst. for Fluid Dynamics, Brissel (1984, 2000-04), ICASE Inst. NASA Langley (1995), Kyoto Univ. (1996), Newton Inst. for Mathem. Sciences, Univ. Cambridge (1999), Chalmers Univ. Geteborg (2000), Michigan State Unive. East Lansing (2000), Sapienza Univ. Rim (2003, 2011), Nat. Univ. Singapur (2004), Data Storrage Inst. (Distingushed Visitor), Singapur (2006), AGH Univ, Krakow (Marie Curie Mobility Programme, 2006-07), Al Farby Univ. Almati (2014), Plumer Visitin Research Fellow of St Anne's College/Osney Thermofliods Lab., Oxforf Univ. (2017), i dr. Održao je više od 70 pozvanih plenarnih i uvodnih (keynote) predavanja na međunarodnim naučnim konferencijama i drugim manifestacijama.

Bio je glavni urednik časopisa "Flow, Turbulence and Combustion" (Springer, 2005-2015) i član uređivačkih odbora više međunarodnih časopisa. Bio je predsjednik Internacionanog centra za prenos toplote i mase ICHT, Ankara (2015-18), te član više naučnih i stručnih organizacija. Inicirao je i vodio (Chairman) više međunarodnih skupova, a od 1994 do 2025 seriju ICHMT konferencija “Turbulence, Heat and Mass Tranfser“ (Lisabon, Delft, Dubrovnik, Antalya, Nagoya, Rim, Palermo, Sarajevo, Rio de Janeiro, Tokyo).

Dobitnik je više nagrada i priznanja za naučna i društvena ostvarenja i posebna postignuća: nagrada Veselin Masleša, BiH (1973), 27-julska nagrada BiH (1989), Max Plank Forschungspreis, Njemačka (1992), Nusselt-Reynolds Prize (2021/2024), Šestoaprilska nagrada grada Sarajeva (2023), AIAA (Američki Institut za Aeronautiku i Astronautiku) Energy Systems Award (2026), odlikovanja Predsjednika Finske (Commander 1st Class reda Lion of Finland, 1986) i Kraljice Nizozemske (Officer reda Oranje-Nassau, 2010), Medalja Luikov-a (ICHT, 2020), viši doktorat (DSc) Univerziteta u Londonu, UK (1998), počasne doktorate (Dr. honoris causa) Univerziteta Reims, Champagne i Ardenne, Francuska (2010) i Internacionalnog Burch Univerziteta u Sarajevu (2018). Izabran je za inostranog člana (Int. Fellow) Kraljevske akademije za tehniku (FREng, UK, 2005) i Ruske Akademije Nauka (2019), te redovnog člana (Fellow of World Islamic Academy of Science, Aman, Jordan (FIAS, 2005), Instituta za Fiziku, London (FInstP, 2004), Američke asocijacije mašinskih inženjera (FASME, 2005) i ICHMT (FICHMT, 2005).

Za člana ANUBiH izabran je 1981, a za redovnog 1987. godine.

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Doktorska disertacija*: Two-dimensional asymmetric turbulent flow in ducts,* PhD Thesis, Imperial College of Science and Technology, University of London, London, UK, 1970.

Magistarski rad: *Heat transfer in simulated nucleate pool boiling,* MSc Thesis, Graduate School of Thermodynamics, University of Birmingham, Birmingham, UK, 1966.

I. Knjige (Books)

I. 1. Autor / koautor (Author / Co-author)

1. **Kemal Hanjalić,** Brian Launder, 2022, *Modelling Turbulence in Engineering and the Environment: Rational Alternative Routes to Closure,* 2nd edition, Cambridge University Press, Cambridge UK. ISBN 978-1-108-83506-0 Hardback, E-ISBN 9781108875400, 534 pages. https://doi.org/10.1017/9781108875400.
2. **Kemal Hanjalić**, Brian Launder, 2011, *Modelling Turbulence in Engineering and the Environment*: *Second-Moments Routes to Closure Closure,* 1st edition, Cambridge University Press, Cambridge UK. ISBN 978-0-521-84575-5, E-ISBN 9781139013314, 380 pages. https://doi.org/10.1017/CBO9781139013314.
3. **Kemal Hanjalić**, Saša Kenjereš, Mark J. Tummers, Harm J.J. Jonker, 2007/2009, *Analysis and Modelling of Physical Transport Phenomena*, VSSD, Delft, The Netherlands. ISBN-13 978-90-6562-165-8, E-ISBN-13 978-90-6562-166-5, 244 pages.
4. Izet Smajević i **Kemal Hanjalić**, 2007, *Toplotne turbomašine,* TKD Šahinpašić, Sarajevo. ISBN 978-9958-41-194-6, 256 pages.
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I. 2. Urednik / kourednik (Editor / Co-editor)

1. Hrvatović, H., Ahmetović, E., **Hanjalić, K.**, Smajević, I. (Eds), 2024, *Geotermalna energija u energetskoj tranziciji Bosne i Hercegovine (Geothermal energy in the energy transition of Bosnia and Herzegovina)*, Regionalno naučno-stručno savjetovanje, ANUBiH, Posebna izdanja (Special Edition), Knjiga CCXVII/Odjeljenje tehničkih nauka/OEEO, knjiga 23; Odjeljenje prirodnih i matematičkih nauka, knjiga 31. ISBN 978-9926-574-06-2, 148 str.
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II. Poglavlja / članci u knjigama (Chapters / Articles in books / edited volumes)

1. **Hanjalić, K.**, Launder B.E., 2020, Eddy-Viscosity Transport Modelling: A Historical Review. In: Runchal, A. (Ed), *50 Years of CFD in Engineering Sciences*, Springer Nature Singapore Pte Ltd., https://doi.org/10.1007/978-981-15-2670-1_9.

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III. Radovi u časopisima (Journal publications)

1. Zerem, E., Vranić, S., **Hanjalić, K.**, Milošević, D. B., 2024, Scientometrics and academia, *Biomolecules and Biomedicine* (Open Access Journal) **24**(2): 207–209. https://doi.org/10.17305/bb.2023.10173.

2. Smajević, I., **Hanjalić, K.**, 2023, Aerovalved pulse combustor for enhancing efficiency and sustainability of fossil energy conversion, *BH Electrical Engineering* Vol. 17*, Special Issue*, 2023:53-60. https://doi.org/10.2478/bhee-2023-0018.

3. Hadžiabdić, M., Hafizović,M., Ničeno, B, **Hanjalić, K.**, 2022, A rational hybrid RANS-LES model for CFD predictions of microclimate and environmental quality in real urban structures, *Building and Environment* **217**, 109042: 1-21. https://doi.org/10.1016/j.buildenv.2022.109042.

4. **Hanjalić, K.**, Launder, B.E., 2021, Reassessment of modeling turbulence via Reynolds averaging: A review of second-moment transport strategy*, Physics of Fluids* **33(9)** 091302, 1-19. https://doi.org/10.1063/5.0065211.

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V. Radovi u konferencijskim zbornicima (Publications in conference proceedings)

V.1. Plenarna i uvodna predavanja (Plenary and Keynote lectures)

1. **Hanjalić, K.**, 2024, Reynolds-averaged turbulence modelling: from EVM to SMC and beyond, *Nusselt-Reynolds Lecture*, *Proc. 10th World Conference on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics (EXHFT-10)*, 26-30 August 2024, Rhodes Island, Greece.
2. **Hanjalić, K.**, 2024, Digitalno upravljanje kvalitetom zraka ('Digitalni Blizanac'): Integralna simulacija mikroklime i rasprostiranja polutanata u realnom vremenu (plenarno predavanje), *Zbornik radova*, *3. Simp. o planiranju kvalitet zraka u gradovima, 17-18 april 2024, Sarajevo, BH.*
3. **Hanjalić, K.**, Hrebtov, M., Kenjereš, S. 2022, Buoyancy-driven microclimate phenomena: URANS, LES or Hybrid modelling? (keynote lecture), *Proc. 17th UK Heat Transfer Conference* (UKHTC2021), 4-6 April 2022, Manchester, UK. http://cfd.mace.manchester.ac.uk/ukhtc21-proc/papers/K-5.pdf.
4. **Hanjalić, K.**, 2022, Computer modelling of thermally-driven microclimate phenomena (*Luikov lecture*), *Proc.Int. Symp. on Convective Heat and Mass Transfe – CONV 22*, 5-10 June 2022, Izmir, (Tutkye), Begell House Inc. New York/Wallingford UK/ICHMT Digital Library. ISSN Online: 2642-3499. ISBN Online: 978-1-56700-523-3. https://doi.org/10.1615/ICHMT.2022.CONV22.10.
5. **Hanjalić, K.** 2020, Modelling Turbulent Flows and Heat Transfer in Internal Flows of Industrial Relevance (keynote lecture), *The International Combustion Institute Summer School (ICISS) on Near-Wall Reactive Flows. Virtual Summer School,* 7-10 June, 2021, Organizer: Technische Universität Darmstadt, Germany.
6. **Hanjalić, K.**, 2019, Computational modelling of industrial and environmental swirling flows: Rational routes to capture the essential Physics (keynote lecture), *7th All-Russian and /Int. Conf. Heat and Mass Transfer and Hydrodynamics in Swirling Flows*, 16-18 Oct. 2019, Rybinsk, Russia.
7. **Hanjalić, K.**, 2019, Challenges in capturing fluid physics in computations of fluid-solid interactions (keynote lecture), *Proc. ECCOMAS MSF 2019 Thematic Conference*, 16-18 Sept. 2019, Sarajevo Bosnia and Herzegovina.
8. **Hanjalić, K.**, 2018, Will RANS survive LES: A perspective in energy, power and environmental engineering (keynote lecture), *Sustainable Energy, Power and Propulsion*, International Workshop, 18-22 March 2018, National Institute of Technology, Kurukshetra, India.
9. **Hanjalić, K.**, 2018, Computational predictions of geophysical and environmental flows: LES, RANS and Hybrid modelling (plenary lecture), *Emerging Trends in Modelling Strategies for Natural Resources Conservation and Waste Management,* Intern. Workshop, 22-23 March 2018, Central Univ. of Himachal Pradash, India.
10. **Hanjalić, K.**, 2018, Some new insights into the potential of RANS models and their blending with LES of engineering and environmental flows (keynote lecture), *Canadian CFD Society – Annual CFD Conference (CFD2018)*, 11-12 June 2018, Univ. of Manitoba, Winnipeg, Canada.
11. **Hanjalić, K.**, 2017, RANS turbulence modelling of unsteady flows: hidden potential, snares and relation to LES (keynote lecture), *Proc. Science and Motor Vehicles – Automotive Engineering for Improved Safety,* XXVI JUMV Intern. Automotive Conference, 19-20 April 2017, Beograd, Serbia, 12 pages.
12. **Hanjalić, K.**, 2017, A tribute to Brian Spalding and his legacy to Thermo-Fluids Science and Engineering (invited lecture), *Fundamental and applicational problems of heat transfer*, Jubilar

conference, of the National Committee of Russian Academy of Science for Heat and Mass Transfer, 22-26 May 2017, St. Peterburg, Russia.

13. **Hanjalić, K.,** 2017, International Centre for Heat and Mass Transfer: one of many legacies of Brian Spalding (invited lecture), 7th *Int. Symp. on Advances in Computational Heat Transfer - CHT17, Spalding's Memorial*, 30 May 2017, Napoli, Italy.
14. **Hanjalić, K.**, 2016, RANS Modelling – Time for a Requiem, ... or a Spring Symphony? (keynote lecture), *14th ERCOFTAC Osborne Reynolds Day*, 14-15 July 2016, Manchester University, UK.
15. **Hanjalić, K.**, 2016, URANS for Environmental Flows: A practical prognostic tool for real scales (invited lecture), *Research Directions in Turbulent Flows,* Expert Seminar, 15 July 2016, Manchester University, UK.
16. **Hanjalić, K.**, 2016*,* Complementing Experiments with Computer Simulations in Thermo- and Fluids Physics (keynote lecture), All-Russian Scientific Conference "*Thermophysics and Physical Hydrodynamics*", 18-26 Sept. 2016, Yalta, Russia.
17. **Hanjalić, K.***,* 2015*,* Revisiting URANS and its role in Hybrid LES/RANS simulations of internal flows (invited lecture), AUTOSIM minisymposium, *Proc. XXV JUMV International Automotive Conference "Science and Motor Vehicles",* 14-15 April 2015, Belgrade, Serbia.
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23. **Hanjalić, K.**, 2012, Some continuing challenges in turbulent convection (invited lecture), *Paradoxes and Unsolved Problems in Heat Transfer*, Symposium dedicated to the 85th birthday of Academician Aleksandr Ivanovich Leontiev, Ruska Akademija Nauka, 23-25 May 2012, Zvenigorod, Russia.
24. **Hanjalić, K.**, 2012, Blending RANS and LES for high Reynolds and Rayleigh wall-bounded flows: potential and snares (keynote lecture), *XX Fluid Mechanics Conference*, 17-20 Sept. 2012, Gliwice, Poland.
25. **Hanjalić, K.**, 2012, Detonation-wave technique for on-load deposit removal in coal-fired boilers (keynote lecture), *VIII Всероссийской конференции с международным участием Горение Твердого Топлива (Combustion of solid fuel)*, 13-16 Nov. 2012, Novosibirsk, Rusia.

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30. **Hanjalić, K.**, 2010, Some continuing challenges in computational turbulent convection (plenary lecture), ASME 2010-3rd Joint US-European Fluids Engineering Summer Meeting, Aug 1-5, 2010, Montreal, Canada, CD-ROM.

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V.2. Članci / saopšenja (Articles / Communications)

1. Đugum, A., **Hanjalić, K.,** 2025, Computational Fluid Dynamics as a tool for operational optimization of the fossil fuels combustion in utility boilers*, Proc. 5th South East Europe Regional Conference (SERC)*, CIGRE, 4-5 June, 2025, Sarajevo, BH, 12 pages.
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VI. Radovi iz opšte tematike (Publications on miscellaneous topics)

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9. **Hanjalić, K.**, 2008, Naučno-tehnološka istraživanja u oblasti termoenergetike kod nas: ranija iskustva, potencijal i perspektive, Simpozij: *Aktuelni tehnološki problemi u energetici BiH: mogućnosti i prilika za sopstveni naučno-istraživački doprinos,* 23 oktobar 2008, Sarajevo.
10. **Hanjalić, K.**, 2006, Towards research and education excellence: Some experience from a European university of technology, *15th Science Conf. on High Education*, Ankara, 7-10 November, 2006, Islamic World Academy of Sciences*,* 18 pages.
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VII. Istraživačko-razvojni i stručni projekti (Research and development and professional projects)

Veći broj elaborata, izvještaja i publikacija o naučno-istraživačkim i razvojim projektima (voditelj projekta ili podprojekta, autor, koautor, urednik), finansiranih od strane nacionanih i međunarodnbih (EU) fondacija za naučni rad, nacionalnih naučno-tehnoloških i istraživačko-razvojnih institucija i industrije: BiH (SIZ za nauku, Energoinvest, Elektroprivreda BiH,…), Austria (AVL List GmnH), Italija (Faggiollatti), Nizozemska (FOM, STW, NWO, TNO, Phillips, Shell, KNH Tata Steel Nederlands,…), Njemačka (DFG, DAAD), SAD (EPA), te projekti u okviru EU programa TEMPUS, INTAS, BRITE EURAM, JOULE, GROWTH, FP5, Marrie Curie Action i dr., od kojih se navode najznačajniji:

1. **Hanjalić, K.** (voditelj/koordinator segmenta projekta - podprojekta) sa Kenjereš, S., 2003-2005, *Magnetic fluid dynamos* – "MAGDYN", EU DG 12; participants: Delft University of Technology

(NL), Institute of Physics of the University of Riga (Latvia), Forschungszentrum Rosendorff and Technische Universität Dresden (Germany), CNRS Grenoble (LEGI, CNRS+INPG + University J. Fourier (France).

2. **Hanjalić, K.** (voditelj/koordinator segmenta projekta), sa Kenjereš, S., 2002-2005, *Minimisation of NOx Emissions*, "MinNOx", EU Programme "Energy, Environment and Sustainable Development"- Key Action 6: "Economic and Efficient Energy for a Competitive Europe"; participants: AVL-List GmbH (Austria), Delft University of Technology (NL), University of Stuttgart (Germany), Chalmers University (Sweden), Kings College, London (UK), DaimlerChrysler AG (Germany), Ford Werke (Germany), AB Volvo (Sweden).

3. **Hanjalić, K.** (voditelj/koordinator), 1998-2002, *Models for Vehicle Aerodynamics* "MOVA", EU BRITE-EURAM III project; participants: Delft University of Technology (Nl), University of Manchester Institute of Technology (UMIST), UK, Institute for Fluid Mechancs, LSTM – University of Erlangen (Germany), AVL-List GmbH, Graz (Austria), Electricitéé de France (EDF) Chatou – Paris, PSA Peugeot Citroeën (DRIA/ SARA/PVMO/AERO), Paris (France).

4. **Hanjalić, K.** (voditelj/koordinator segmenta projekta), 1996-1999, *Study and modelling of Narwall Turbulence in IC Engines,* EU JOULE III Programme, participants: TU Delft (Nl), LSTM University of Erlangen (Germany), *Laboratoire de Mécanique des Fluides et d'Acoustique* – LMFA (Franc), Ecole Centrale de Lyon, Renault S.A. (France).

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7. **Hanjalić, K.** (voditelj/koordinator), 1985-91, *Razvoj i proizvodnja energetske, procesne i druge mašinske opreme visoke efikasnosti na bazi malootpadnih tehnologija sa novim vidovima konverzije energije*, Društveni cilj VIII A, Mašinski fakultet u Sarajevu, (SIZ za nauku BiH uz učešće svih začajnijih preduzeća u BiH u oblasti projektovanja, proizvodnje i izgradnje energetskih i procesnih postrojenja i opreme, Instituti i fabrike Energoinvesta, Unioninvest, UNIS, Famos, Elektroprivreda BiH i drugi).

8. **Hanjalić, K.** (voditelj/koordinator), Sijerčić, M., 1981-91. *Razvoj novog koncepta kontinuirane gasifikacije sprašenog uglja u strujnom reaktoru: Komputerska simulacija i laboratorijsko-eksperimentalna verifikacija.* SIZ Nauke BiH, Institut za termotehniku i nuklearnu tehniku ITEN-Energoinvest.

9. **Hanjalić, K.** (voditelj, koordinator), 1982-1991, Smajević, I., *Primjena kontroliranih detonacionih talasa za kontinuirano pogonsko otklanjanja čvrstih naslaga/depozita sa ogrijevnih površina kotlova loženih ugljem: Eksperimentalno istraživanje, razvoj tehnike i primjena u realnim termoenergetskim postrojenjima.* SIZ nauke BiH, Termoelektrana Kakanj, Elektroprivreda BiH.

10. **Hanjalić, K.** (voditelj/koordinator), Jakić, J., Stikić, Đ., 1980-84. *Razvoj pokretnih elektro-agregata (mobilne elektrane) na bazi isluženih avionskih mlaznih motora, Projektna studija*, Institut za termotehniku i nuklearnu tehniku ITEN, Institut za elektroenergetiku IRCE – Energoinvest, Sarajevo, Vojno-tehnički Institut Beograd.

11. **Hanjalić, K.** (voditelj, koordinator), Stošić, N., Alslanagić, M., 1975-91, *Razvoj novih i usavršavanje standardnih tipova klipnih i vijčanih kompresora (piston- and screw compressors); Eksperimentalno istraživanje i komputerska simulacija.* SIZ Nuke BiH, Institut za termotehniku i nuklearnu tehniku ITEN-Energoinvest, Trudbenik - Energoinvest, BiH.

12. Mirković, Z., **Hanjalić, K.** (saradnik),1964-72, *Eksperimentalno istraživanje prenosa toplote na oreebrenim cijevima u parogeneratorima gasom-hlađenih nuklearnih reaktora (AGCR NE)*, ITEN-Energoinvest, Sarajevo, BiH.

VIII. Patenti, Kompjuterski programi (Patents, Computer software)

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2. Ničeno, B., **Hanjalić, K.**, 2002, *"T-RexS" program za LES (Large-Eddy Simulation) (numeričku dinamiku fluida, Computational Fluid Dynamics, CFD), User Manual* (vidi također II.3); istraživački otvoreni software, baziran na metodi konačnih volumena za nestruktuiranu numeričku mrežu.
3. Stošić, N., **Hanjalić, K.**, 1988-1993**,** *"SCORPATH" program za kompjutersku simulaciju procesa u vijčanim kompresorima: User Manual,* Mašinski fakultet u Sarajevu. Software razvijen prvobitno za Tvornicu kompresora Energoinvest – Trudbenik, Doboj. Prerađen i proširen 1993 na Univerzitetu u Erlangenu (Njemačka), komerijaliziran u firmi M.A.N., Oberhausen, Njemačka. Nakon dodanih dopuna i proširenja, koristi se i danas u Centru za razvoj kompresora City Univerziteta u Londonu, te u nekoliko proizvođača kompresora u svijetu.
4. Smajević, I., **Hanjalić, K.**, 1988, patent P1728/88, *Uređaj za pouzdano pogonsko čišćenje ogrijevnih površina termoenergetskih i drugih kotlova velike snage pomoću detonacionih talasa*, Jugoslovenski patentni zavod, Beograd, 1988. Metod razvijen i testiran u laboratoriju Mašinskog fakulteta u Sarajevu 1983-1986, instaliran i u pogonu (sa manjim prekidima) na dva kotla snage po 300 MWth u TE Kakanj od 1987 godine do 2011. Višestruko citiran u *US Patents*. Interes za ovu tehnologju pokazali ALSTOM (Njemačka), Pratt & Witney i Diamond Power (USA), Ansaldo (Italija), Elektroprivreda Tesalije i Makedonije u Grčkoj i drugi.
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IX. Mentorstvo doktorskih disertacija (Supervison of PhDs)

1. Adnan Đugum, *Numerical study of staged combustion of pulverized-coal-fired steam boilers - Effects of simulation of real burners on predicting combustion anomalies,* 12.3.2018*,* Mašinski fakultet Univerziteta u Sarajevu, Bosna i Hercegovina.
2. Stefano Minnoti, *Innovative turbulence models for the simulation of air turbines in wave-energy conversion systems*, 28.03.2011, Sapienza University of Rome, Italy.
3. Giovanni Delibra, *URANS, LES and hybrid RANS/LES of flow and heat transfer in thermal turbomachinery*, 01.02.2011, Sapienza University of Rome, Italy.
4. Jos Verdoold, *Long-term unsteadiness and large-scale structures in Rayleigh-Bénard convection with and without electro-magnetic forcing,* 26.10.2010, TU Delft, Netherlands.

5. Werner Hübner**, *Structures in turbulent, non-premixed swirling natural gas flames,* 2010, TU Delft, Netherlands.
6. Paolo Venturini, *Modelling of wall-deposit formation in two phase gas-solid flows*, Dec. 2009, Sapienza University of Rome, Italy.
7. Björn Kniesner*, *Ein hybrides LES/RANS-Verfahren für konjugierte Impuls-, Wärme- und Stoffübertragung mit Relevanz zu Brennkammer-konfigurationen*, 20.1.2008, TU Darmstadt, Germany.
8. Maarten van Reeuwijk, *Direct simulation and regularization modelling of turbulent thermal convection*, 12.03.2007, TU Delft, Netherlands.
9. Mirza Popovac, *Modelling and simulation of turbulence and heat transfer in wall-bounded flows*, 16.10.2006, TU Delft, Netherlands.
10. Muhamed Hadžiabdić, *LES, RANS and combined simulation of impinging flows and heat transfer*, 09.01.2006, TU Delft, Netherlands.
11. Leon Geers, *Multiple-impinging jet arrays: an experimental study on flow and heat transfer,* 09.02.2004, TU Delft, Netherlands.
12. Lukas Thielen, *Modelling and calculation of flow and heat transfer in multiple-impinging jets*, 09.12.2003, TU Delft, Netherlands.
13. Gunarjo S. Budi, *Contribution to advanced modelling of turbulent natural and mixed convection*, 10.10.2003, TU Delft, Netherlands.
14. Krzysztof M. Stawiarski, *Multiple-scale closures for non-equilibrium turbulent flows*, 03.03.2003, TU Delft, Netherlands.
15. Nicolas P. Waterson, *Simulation of turbulent flow, heat and mass transfer using residual-distribution approach*, 13.01.2003, TU Delft, Netherlands.
16. Bojan Ničeno, *An unstructured parallel algorithm for large-eddy and conjugate heat transfer simulations*, 19.11.2001, TU Delft, Netherlands.
17. Aris Twerda, *Advanced computational methods for complex flow simulation*: 11.12.2000, TU Delft, Netherlands.
18. Robbert L. Verwej, *Parallel computing for furnace simulations using domain decomposition*, 01.10.1999, TU Delft, Netherlands.
19. Ibrahim Hadžić***, *Second-moment closure modelling of transitional and unsteady turbulent flows*, 08.02.1999, TU Delft, Netherlands.
20. Saša Kenjereš, *Numerical modelling of complex buoyancy-driven flows*, 02.02.1999, TU Delft, Netherlands.
21. Henry Dol, *Turbulence models fort natural convection in side-heated enclosures*, 15.12.1998, TU Delft, Netherlands.
22. Erwin R. Meinders, *Experimental study of heat transfer in turbulent flows over wall-mounted cubes,* 02.11.1998, TU Delft, Netherlands.
23. Pieter A. Nooren, *Stochastic modelling of turbulent natural-gas flames,* 14.09.1998, TU Delft, Netherlands.
24. Suad Jakirlić, *Reynolds-Spannungs-Modellierung komplexer turbulenter Strömungen,* 26.03.1997, University of Erlangen, Germany.
25. Rajfa Musemić, *Prilog razvoju matematskog modela penetrativne turbulentne dvojne difuzije u nestacionarnom stratificiranom fluidu*, 25.11.1996, Univerzitet u Ljubljani, Slovenia.

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27. Slavko Vasić, *Matematsko modeliranje prirodne termalne konvekcije u zatvorenim prostorima*, 1991, Univerzitet u Sarajevu, Bosna i Hercegovina.

28. Miroslav Sijerčić, *Matematski model simultanog sagorijevanja i gasifikacije sprašenog uglja*, 1991, Univerzitet u Sarajevu, Bosna i Hercegovina.

29. Leopold Škerget[*], *Robni elementi za nelinearne potencialne probleme in tok viskoznega fluida*, 1984, Univerzitet u Mariboru, Slovenia.

30. Nikola Stošić, *Numeričko modeliranje unutarnjih nestacionarnih tokova stišljivog fluida*, 25.06.1982, Univerzitet u Sarajevu, Bosna i Hercegovina.

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Nedovršene disertacije:

32. Tieying Ding, *Laser diagnostics in turbulent flames*, 1998-2002, TU Delft, Netherlands, *odustala zbog porodičnih razloga (unfinihsed)*.

33. Emiel van der Plas, *Hybrid simulations of natural convection*; 2000-2004 TU Delft, Netherlands, *odustao zbog bolesti (unfinished).*

34. Savjetnik (PhD/DSc Advisor)[****] nekolicini doktoranata na Državnom univerzitetu Novosibirsk, Ruska Federacija, tokom boravka u svojstvu Lead Scientist (grant Ministrstva za obrazovanje i nauku RF, 2011-2016): Rustam Mukkyadzhanov, Egor Palkin, Ivan Litvinov, Andrej Gavrilov, Michael Chernetskiy,…)

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[*] Ko-mentor
[**] Neodbranjena disertacija, kandidat preminuo 3. maja 2010. nakon predaje koncepta disertacije.
[***] Preminuo 27. septembra 2010.
[****] Kao gost, neuautorizovan da bude formalno mentor ili komentor.